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Physical activity (PA) provides numerous health benefits; however, PA levels decline as children age. Primary care-based physical activity interventions (PAI) are moderately effective in increasing youth PA levels. Medical organizations recommend that physicians provide PAI; however, physician PAI rates are low. There are several barriers to PAI, including physicians' lack of PAI knowledge and skills. PAI medical education is severely limited. Therefore, there is a need to develop and evaluate medical education PAI curricula.

The primary purpose of this study was to develop, implement, and evaluate a PAI curriculum for pediatric residents; focusing on pre to posttest changes in residents' PAI knowledge, attitudes, and behaviors (KAB). The secondary purpose was to determine residents' perceptions of the instructional strategies. An embedded mixed methods design was used, with qualitative data embedded in quantitative data. Participants (n = 13) were administered the KAB Assessment before and after the program and a Participant Feedback form after the program. Additionally, instructor field notes and focus group responses were collected.

A paired t test showed a significant pretest to posttest increase in PAI knowledge scores. A MANOVA indicated a significant increase in positive PAI attitudes. Follow-up univariate analyses showed significant effects and near significant effects for the attitudes constructs of perceived knowledge and feasibility, respectively. Paired t tests showed a significant increase only for the PAI behavior of PA prescription. However,

participants reported higher rates of PAI behaviors than in previous literature. Most useful, least useful, and alternative instructional strategies were considered; along with limitations, strengths, and future directions for this PAI curriculum study.

DEVELOPMENT AND EVALUATION OF A TRAINING
PROGRAM FOR PEDIATRIC RESIDENTS ON
PHYSICAL ACTIVITY INTERVENTIONS

by

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APPROVAL PAGE

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CHAPTER I

INTRODUCTION

The developmental, physical, and mental health benefits of physical activity (PA) are well-documented and are numerous for both youth and adults (Office of Disease Prevention and Health Promotion [ODPHP], 2008). However, as youth age from childhood through adolescence and into adulthood, their PA levels fall steadily (Pate, Freedson & Sallis, 2002). Strong evidence for PA benefits combined with decreasing PA levels across the lifespan support to the need for youth PA interventions (PAI). Physical activity interventions have been implemented in multiple settings; including families, schools, work sites, community centers, churches, and health care centers. Specifically, the health care system has been identified as a critical setting for PAI by Healthy People 2020 and several major medical organizations (Sallis, Patrick, Frank, Pratt & Wechsler, 2000; US Department of Health and Human Services [USDHHS], 2009); however, few physicians provide PAI (USDHHS, 2007) citing barriers such as lack of knowledge, time, and confidence (Rowland, Carlin, & Nordstrom, 2007). Therefore, youth PAI in the health care setting must address these barriers, particularly knowledge barriers, since very few physicians receive formal training in providing PAI (Garry, Diamond, & Whitley, 2002).

Statement of the Problem

In order to address these barriers and increase the prevalence of pediatric primary care-based PAI, there is a need for increased PAI medical education. The call for PAI medical education is voiced by medical educators, residents and students who feel that PAI education is important but lacking. Garry and colleagues surveyed medical school assistant deans and found that although 61% of responding schools believed it was the responsibility of the medical school to educate their students in PAI, only 13% of responding schools actually had a PAI curriculum (Garry et al., 2002). Furthermore, Rogers and colleagues found that while 96% of residents felt it was the physicians' responsibility to counsel patients on PA, 91% felt that they needed additional training in PA counseling (Rogers et al., 2002). The few published PAI curricula that were identified (Ritchie, Stetson, Bass, & Adams, 2002; Bass, Stetson, Rising, Wesley & Ritchie, 2004) showed an improvement in PAI knowledge and some attitudes; however, these studies did not measure changes in PAI behaviors. In the following sections, the benefits and guidelines for youth PA will be examined, and the rationale and barriers for primary care-based PAI will be reviewed.

Benefits of Physical Activity for Youth and Adults

The health benefits of PA were recently evaluated for development of the 2008 Physical Activity Guidelines for Americans. The US Department of Health and Human Services (2009) convened committee meetings to examine the evidence for the relationship between PA and health and to categorize the evidence by "type" and "strength" according to the following criteria:

- Type 1
 - Randomized controlled trials (RCT) (or meta-analyses) without major limitations
- Type 2
 - 2a: RCTs (or meta-analyses) with important limitations
 - 2b: Non-randomized clinical trials
- Type 3
 - 3a: Well-designed prospective cohort studies and case-control studies
 - 3b: Other observational studies, e.g., weak prospective cohort studies or case-control studies; cross-sectional studies or case series
- Type 4
 - Inadequate, very limited, or no data in population of interest. Anecdotal evidence or no/little clinical experience
- Strong: consistent across studies and populations
- Moderate: reasonably consistent
- Weak: evident but inconsistent across studies and populations

Tables 1 and 2 summarize the relationship between PA and various health outcomes, as well as type and strength of the evidence for these relationships in youth (children and adolescents ages 6-21) and adults (adults and older adults), respectively.

Table 1.

The Relationship Between PA and Health for Children and Adolescents

Relationship Between PA and Health	Type of Evidence	Strength of Evidence
Improved cardiorespiratory fitness	Type 1, 2a, 2b, 3a, 3b	Strong
Improved muscular strength	Type 2b	Strong
Improved bone health	Type 1, 3a	Strong
Improved cardiovascular and metabolic biomarkers (e.g., blood pressure, HDL, Triglycerides)	Type 1, 2b, 3a, 3b	Strong
Favorable body composition	Type 1, 2b, 3a, 3b	Strong
Depression	Type 1, 2b, 3a, 3b	Moderate
Anxiety	Type 1, 3b	Weak
Self-esteem	N/A	Weak

In addition to these health benefits, there is limited evidence suggesting that PA is important for timely attainment of key developmental motor tasks or milestones such as rolling, walking and jumping in infants and toddlers (Haywood, 1993). The evidence for the role of PA in promoting motor development largely comes from two areas of research: (a) studies of institutionalized or cradle-bound infants/toddlers whose movement was restricted; and (b) studies of infants/toddlers in enrichment programs who received activity-specific training (e.g., pre-walking training) or movement enticements such as the placement of toys just out of their reach. Youth in the movement deprivation studies generally achieved the development milestones much later, and sometimes never

fully achieved normal motor control for certain movements. These findings indicate that there are developmental windows where dynamic development of the brain, musculature, and other body systems comes together to facilitate the learning of new movement patterns (Haywood, 1993).

Table 2.

The Relationship Between PA and Health for Adults and Older Adults

Relationship Between PA and Health	Type of Evidence	Strength of Evidence
Lower risk of early death	Type 3a	Strong
Lower risk of coronary heart disease	Type 3a	Strong
Lower risk of stroke	Type 3a	Strong
Lower risk of high blood pressure	Type 1	Strong
Lower risk of adverse blood lipid profile	Type 1	Strong
Lower risk of type 2 diabetes	Type 2a and 3a	Strong
Lower risk of metabolic syndrome	Type 3a, 3b	Strong
Lower risk of colon cancer	Type 3a	Strong
Lower risk of breast cancer in women	Type 3a	Strong
Lower risk of lung cancer	Type 3a (few)	Moderate
Lower risk of endometrial cancer	Type 3a (few)	Moderate
Prevention of weight gain	Type 1, 2, 3a	Aerobic: Strong RT: Moderate
Reduced abdominal obesity	Type 1, 2	Aerobic: Moderate to strong RT: Weak
Improved weight loss, particularly when combined with reduced calorie intake	Type 1	Aerobic: Strong

Table 2. (continued)

Relationship Between PA and Health	Type of Evidence	Strength of Evidence
Weight maintenance after weight loss	Type 2	Aerobic: Moderate
Improved cardiorespiratory fitness	Type 1	Strong
Improved muscular strength		Strong
Better functional health for older adults	Type 3a, Type 1	Moderate to strong
Increased bone density	Type 1, 2a	Moderate
Prevention of falls	Type 1	Strong
Lower risk of fracture	Type 3a	Hip: Moderate Vertebrae: Weak
Mild protection against Osteoarthritis	Type 3a	Weak
Improved disease management for Osteoarthritis, Rheumatoid Arthritis, and Fibromyalgia	Type 1	Strong
Better cognitive function for older adults	Type 1, 2a, 3a and 3b	Strong
Reduced depression	Type 1, 2a, 3a and 3b	Strong
Reduced anxiety	Type 1, 2a, 3a and 3b	Strong
Improved sleep quality	Type 1, 2a, 3a and 3b	Moderate

Infants/toddlers in the enrichment studies sometimes achieved developmental milestones earlier, but did not necessarily show superior motor performance to age-similar peers later in childhood. These findings suggest that age-appropriate physical activity opportunities help infants/toddlers develop normally, but highly specialized physical activity or training in infants/toddlers is not necessary. In summary, maintaining recommended PA levels during infancy, toddler years, childhood and adolescence is

important for promoting motor development, preventing overweight/obesity, reducing chronic disease risk factors, and improving mental health. In the next section, the PA guidelines for infants, toddler, children, adolescents, and adults are summarized, along with the prevalence of individuals meeting these recommendations.

Physical Activity Guidelines and Prevalence

The National Association for Sport and Physical Education (NASPE, 2009) has published PA guidelines to promote healthy development in infants and toddlers (Table 3), while the US Department of Health and Human Services (USDHHS, 2008) has published PA guidelines for youth ages 6-21 years old and adults/older adults >21 years old. Youth should perform moderate to vigorous PA for 60 minutes or more daily and vigorous PA at least 3 days per week. As part of their 60 or more minutes of daily PA, children and adolescents should include muscle-strengthening PA on at least 3 days of the week and bone-strengthening PA on at least 3 days of the week (USDHHS, 2008). To achieve the above-mentioned PA benefits, children and adolescents should perform moderate to vigorous PA for 60 minutes or more daily and vigorous PA at least 3 days per week. As part of their 60 or more minutes of daily PA, children and adolescents should include muscle-strengthening PA on at least 3 days of the week and bone-strengthening PA on at least 3 days of the week (USDHHS, 2008). Adults should perform aerobic PA of moderate intensity for at least 150 minutes/week, or 75 minutes/week of vigorous intensity, or an equivalent combination; and muscle-strengthening activities on 2 or more days per week.

Table 3.

NASPE PA Guidelines for Infants and Toddlers/Preschoolers

Infants
(a) Provide infant/caregiver interactions that promote PA through exploring movement and the environment.
(b) Caregivers should place infant in settings that stimulate movement experiences and active play.
(c) Infant PA should promote skill development.
(d) Ensure environment meets/exceeds safety standards.
(e) All caregivers should understand importance of providing structured and unstructured PA opportunities.

Toddlers/Preschoolers
(a) Toddlers should accumulate 30 minutes of daily structured PA. Preschoolers should accumulate 60 minutes of daily structured PA.
(b) Toddlers and Preschoolers should accumulate 60+ minutes of unstructured PA and should not be sedentary for more than 60 minutes at a time (except sleeping).
(c) Ensure access to indoor and outdoor areas that meet/exceed safety standards.
(d) Preschoolers should be encouraged to establish competence in fundamental motor skills.
(e) All caregivers should understand importance of providing structured and unstructured PA opportunities.

Despite the benefits of PA for youth and adults, few meet these PA guidelines.

According to the 2008 National Health Interview Survey only 43.5% of adults met the aerobic recommendation, 21.9% of adults met the muscle-strengthening

recommendation, and only 18.2% met the objective for both aerobic and muscle strengthening PA (USDHHS, 2009). According to the 2009 Youth Risk Behavior Surveillance System (YRBSS), only 18.4% of adolescents met the aerobic recommendation (USDHHS, 2009). Physical activity levels fall dramatically from childhood through adolescence. Pate and colleagues used accelerometers to objectively measure PA in a regional sample of first to twelfth graders. Sixty-nine percent of participants accumulated 60 minutes of moderate to vigorous physical activity (MVPA); however, compliance with guidelines fell dramatically from 100% in the youngest age groups to 29.4% in 10th to 12th graders (Pate et al., 2002).

Rationale for Pediatric Physical Activity Interventions

Compared to adults, children are at lower risk for physical inactivity and obesity, and are rarely diagnosed with chronic physical and mental health disorders. However, pediatric PAI are necessary because PA habits during childhood and adolescence may track into adulthood. That is, individuals who are not sufficiently active as adolescents may be more likely to be inactive adults, although this issue needs further research (Boreham et al., 2004). Furthermore, obesity status, which is associated with physical inactivity, may also track from childhood into adulthood, especially for obese adolescents (Meriwether, Lobelo, & Pate, 2008). For example, Stark and colleagues found that that among 11 year old obese children, 40% were still overweight or obese at age 26 (Stark, Atkins, Wolff, & Douglas, 1981).

Therefore, the first rationale for pediatric PAI is to reduce obesity and chronic disease risk factors because the pathological processes that lead to these diseases may

start in childhood. For example, Armstrong and colleagues reported that coronary artery disease risk factors such as atherosclerotic lesions are evident in anywhere from 5% to 47% of British teenagers, setting them up for significant risk for coronary artery disease as adults (Armstrong & Welsman, 1997). Also, sedentary youth may have inadequate bone density development during their pediatric and early adult years leading to elevated risk for osteoporosis in middle to late adult years (Kirchner, Lewis, & O'Connor, 1996). Despite the intuitive rationale to promote pediatric PAI to reduce adult cardiometabolic diseases (cardiovascular disease, type 2 diabetes, and metabolic syndrome), it is important to note that most (but not all) risk factor reduction in pediatric PA studies is mediated by weight or body fat or levels. That is, when you control for obesity, the ameliorative effects of PA on cardiometabolic disease risk factors are generally not evident in kids while they are in adults (Strong et al., 2005). Other chronic disease risks that may begin in youth, such as osteoporosis, are not mediated by weight.

The second rationale for pediatric PAI is to reduce negative mental health symptoms such as depression, anxiety, and low self-esteem (Strong et al., 2005). The third rationale for pediatric PAI is to promote age-appropriate motor development so individuals are more likely to have positive PA experiences as youth and adults (Hagan, Shaw & Duncan, 2008). For example, an infant/toddler who is often restrained in an infant swing or stroller may experience delayed motor development in walking and running and subsequently lag behind peers in transitional and complex activities, causing negative PA experiences. Youth with negative PA experiences may develop a dislike of physical activity and be less likely to value or seek PA as an adult. The final rationale for

youth PAI, then, is to establish lifetime PA habits by promoting positive PA experiences through timely motor development and emphasis on fundamental skills and enjoyment (Hagan et al., 2008).

Primary Health Care as an Intervention Setting

Due to decreasing PA levels in the population, especially as individuals age; PAI have been conducted in multiple settings including families, schools, work sites, community centers, and health care centers (Elder et al., 2006). Drawing from the social ecological model, effective PAI should address PA at multiple levels of influence, including the intrapersonal (individual), interpersonal (friends and family), organizational (work site, church, etc.), community, and public policy (land use planning, health care reimbursement policies, etc. [Elder et al., 2006]). Accordingly, health care-based PAI can reflect the social ecological model by providing individualized screening and counseling along with referral to community PA resources and advocacy for PA policies.

Within the health care system, there are many reasons for integrating PAI into the primary care framework. First, primary care physicians are well-situated to address physical inactivity because they carry credibility and trust among their patients (Wake et al., 2008). Second, primary care services are highly accessible, providing health supervision for families across the cultural and socioeconomic spectrum (Wake et al., 2008). Third, primary care can provide individuals with repeated exposure to an intervention because patients typically visit their primary care clinic multiple times a year over several years. For example, the number of physician office visits in the US in 2001–02 for children under 15 years was 5.7 visits per year for those with insurance and 3.3

visits per year for those covered under Medicare, Medicaid, no insurance, or other (Wake et al., 2008). According to Whitlock and colleagues, this “continuity of care” provides practitioners with multiple opportunities to “sustain individual motivation, assess progress, provide feedback, and adjust behavior change plans” (Whitlock, Orleans, Pender & Allan, 2002, p. 269). Fourth, patients are seeking preventive health advice from their primary care practitioners. In a survey of adults in a health maintenance organization, most participants (92% to 98%) indicated that they expected advice and help from the healthcare system for key behaviors such as diet and exercise (Vogt et al., 1998). Finally, health care economists have emphasized the importance of PAI, especially in the context of treatment for obesity, cardiovascular and metabolic disorders, to control spiraling health care costs. For example, Pratt and colleagues estimated that the U.S. health care system could save up to \$76 billion dollars annually if every adult met the current PA recommendations (Pratt, Macera, & Wang, 2000).

Primary care-based PAI typically involve “behavioral health counseling,” which draws from a number of theoretical and counseling constructs to help patients plan behavior change. Primary care is the most likely health care context for PA counseling because primary care providers are tasked to provide preventive health services, one of which has been identified as PA counseling interventions (Sallis, Patrick, Frank, Pratt, & Wechsler, 2000). Given the potential for primary care-based PAI to impact a large proportion of the pediatric population and the implicit function of primary care to target preventive health, Healthy People 2020 has issued the following PA objectives (USDHHS, 2009, n.p.):

- PA 11.1 Increase the proportion of office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include counseling or education related to exercise.
- PA 11.2 Increase the proportion of physician visits made by all child and adult patients that include counseling about exercise.

Additionally, several health and medical organizations have published recommendations (i.e., position statements, practice guidelines) to inform providers of the importance of health care-based PAI, particularly in primary care (Sallis et al., 2000). Table 4 summarizes these recommendations. The American Academy of Pediatrics (AAP) in particular has published multiple guides and toolkits to promote PAI during primary care health supervision visits (i.e., well-child visits). These PA guides have been developed through the AAP Bright Futures campaign, an initiative that addresses children's health needs in the context of family and community and provides resources for improving and maintaining infant, child, and adolescent health (<http://brightfutures.aap.org/>). Bright Futures was initiated by the Maternal and Child Health Bureau (part of USDHHS) and is now co-sponsored by AAP, who promotes the use of Bright Futures resources for training current and future pediatricians.

The 2001 toolkit titled *Bright Futures in Practice: Physical Activity* summarized knowledge and behaviors that physicians, medical educators, and researchers should learn to provide effective PAI (Patrick, Spear & Holt, 2001):

Table 4.

Medical and Public Health Recommendations for PAI

Organization	Recommendations
American Academy of Pediatrics	Pediatric providers should: <ul style="list-style-type: none"> (a) assess PA for children 3 years of age and older (b) teach the importance of regular moderate PA (c) encourage parents to be active with their children (d) encourage parents to serve as active role models.
American Heart Association	<ul style="list-style-type: none"> (a) Physicians should instruct all patients about adopting healthy life habits that will prevent intensification of risk factors. (b) Patient education should be family oriented. (c) Primary prevention of disease via PA interventions should begin in the early school years. (d) Physicians and their staff should discuss PA and provide exercise prescriptions for patients and their families.
American Medical Association	Health care providers should: <ul style="list-style-type: none"> (a) deliver annual health counseling to all adolescents about the benefits of proper diet, how to achieve a healthy diet, and how to safely manage weight, (b) and annual health guidance to all adolescents to promote physical fitness.
Center for Disease Control and Prevention	Health care providers should: <ul style="list-style-type: none"> (a) assess PA patterns among young people (b) counsel them about PA and refer them to appropriate programs, and (c) advocate for PA instruction among young people.
National Center for Education in Maternal and Child Health World Health Organization/ International Federation of Sports Medicine	<ul style="list-style-type: none"> (a) Primary care practitioners should provide age-specific counseling on nutrition and regular PA. (a) Recommends educating or reeducating physicians, other health professionals, and teachers about promoting PA among young people and setting good examples.

Note: adapted from Sallis et al., 2000

- Importance of PA as it relates to motor development tasks (e.g., learning to walk)
- Health benefits of PA for youth
- Prevalence and correlates of pediatric PA
- Pediatric PA guidelines
- Management of PA in light of health issues (e.g., asthma)
- Implementation of PA screening tools
- Strategies for delivery of PA counseling
- Characteristics of effective PA programs, leaders and coaches
- Partnering with families, schools, and communities to foster youth PA opportunities

The Bright Futures toolkit advises providers to apply the knowledge and skills as follows:

- Incorporate [PAI] into each health supervision visit.
- Develop and evaluate [patients'] physical activity programs.
- Implement standards of practice and protocol [to support PAI].
- Educate children, adolescents, and their families [about PA].
- Refer families to PA resources.
- Support studies to determine the efficacy of Bright Futures PA guidelines.

Prevalence and Barriers for PAI

Although there is strong evidence for the health benefits of PA; and patients, medical organizations, and health promotion organizations support the provision of PAI

in primary care; physician PA counseling rates are low. According to the 2007 National Ambulatory Medical Care Survey, only 7.9% of physician office visits made by youth and adults included PA counseling or education (USDHHS, 2007). There are several barriers to physicians providing PAI, including knowledge of appropriate PA recommendations, confidence in the efficacy of providing PAI, and time to provide PAI during routine health care visits (Rowland et al., 2007). Physicians may lack knowledge and self-efficacy for PAI because they receive limited to no training in medical school and residency programs (Garry et al., 2002).

In the medical schools or residency programs with a PAI curriculum, few studies have been conducted to evaluate the effect of the curriculum on knowledge, attitudes, and behaviors (Ritchie, Stetson, Bass & Adams, 2002; Bass, Stetson, Rising, Wesley & Ritchie, 2004). The available studies primarily assess pre to posttest changes in medical students'/residents' PAI knowledge and attitudes, but none of the studies assessed whether medical students/residents increased their use of PAI behaviors following the educational intervention.

Purpose and Hypothesis

To overcome these limitations in the primary care-based PAI research, the purpose of this study was to develop, implement, and evaluate a PAI training program for pediatric residents; particularly focusing on pre to posttest changes in residents' knowledge, attitudes, and behaviors. The secondary purpose was to determine residents' perceptions of the instructional strategies to refine the curriculum for subsequent cohorts.

It was hypothesized that residents' knowledge and positive attitudes related to PAI would improve following the training program. For example, Bass and colleagues found that a PAI curriculum for first year medical students significantly increased knowledge and positive attitude (self-confidence, necessity, utility) scores from pre to post-test (Bass et al., 2004). No studies; however, have examined changes in resident PAI behaviors following a medical education intervention, therefore no hypothesis was proposed. It was also expected that residents would positively evaluate the training program and provide constructive feedback about the instructional strategies. This evaluation and feedback will be used to improve the training program.

CHAPTER II

REVIEW OF THE LITERATURE

The majority of the evidence on best practices for pediatric primary care-based PAI comes from research assessing the efficacy of implementing PAI in the clinic (Patrick et al., 2001; Ortega-Sanchez et al., 2004; Ariza, Greenberg, LeBailley & Binns, 2005; Olson et al., 2005; Patrick et al, 2006). The main outcome for these efficacy studies was patient changes in PA level, which increased significantly across all studies, though not for all groups.

This chapter will review the literature on physical activity interventions (PAI) in pediatric primary care; examining the rationale, design, and efficacy of these interventions. Furthermore, this review will consider the limited evidence on PAI training in medical education. This information was used to develop a PAI curriculum for pediatric residents.

Physical activity interventions are a subset of “behavioral counseling interventions” which were formally defined by Whitlock and colleagues for the US Preventive Services Task Force as “those activities delivered by primary care clinicians and related healthcare staff to assist patients in adopting, changing, or maintaining behaviors proven to affect health outcomes and health status” (Whitlock, Orleans, Pender & Allan, 2002, pp. 269-270). Behavioral counseling interventions may address multiple health behaviors (e.g., nutrition, smoking, physical activity, etc.), involve a variety of practitioners (e.g.,

physician, physician assistant, nurse, allied health, etc.), and occur at different points during primary care services, including pre-appointment screening, during well-care or sick visits, or via follow-up contacts (Whitlock et al., 2002). Whitlock and colleagues emphasized that behavioral counseling interventions include personal counseling as well as related behavior change strategies. In this sense, personal counseling is viewed as a strategy within behavioral counseling interventions and is described as “engaging patients actively in the self-management practices needed to change and maintain healthy behaviors” (Whitlock et al., 2002, p. 270).

Similarly, PAI may include personal counseling as well as related behavior change strategies such as screening, prescription (recommend frequency, intensity, time, and type [FITT] of PA), self-monitoring, written materials (i.e., brochures), community resource referral (i.e., to local PA facilities and programs), and fitness testing. Within personal counseling, a combination of approaches are typically used, including stage-tailored counseling, Motivational Interviewing, and 5As.

Theories and Models for PAI

In some primary care-based PAI studies, the counseling approach serves as the organizing framework for the intervention. Alternatively, some studies employ a counseling approach that is integrated within the broader framework of an intervention theory or model. For example, the Physician-Assessment and Counseling (PACE+) intervention is broadly based on the Transtheoretical Model (TTM) and Social Cognitive Theory (SCT) and uses a motivational interviewing (MI) counseling approach (Patrick et al., 2001). The most commonly utilized counseling approaches in the primary care-based

PAI literature are MI and variations of the Assess, Advise, Agree, Assist, Arrange model (5 A's). The most commonly cited intervention theories/models include the Transtheoretical Model (TTM) and Social Cognitive Theory (SCT). These approaches, theories, and models will be described more in-depth in the next section followed by a review of some of the more robust primary care-based PAIs that utilize these frameworks.

Motivational Interviewing

Among counseling approaches, MI is currently one of the most popular in behavioral medicine. Originally described by Miller and Rollnick (1991) for addictive behaviors, this client-centered approach has more recently been applied to a wide range of health behaviors, including PA. The goal of MI is to explore ambivalence and elicit motivation for change. The counseling approach is non-judgemental, empathetic, and, most importantly, guiding rather than directive, and informational. Instead of giving advice, the counselor guides the individual to consider their own reasons for and against behavior change. Counselors use several techniques to facilitate this guiding approach, including reflective listening, positive affirmations, building discrepancy, allowing to client to interpret information, rolling with resistance, and eliciting change talk (Resnicow, 2006). A core principle of MI is that individuals are more likely to accept and act on plans elicited through self-guided discovery; therefore, individuals are encouraged to explore their own reasons and plans for change (i.e., elicit change talk). Resnicow (2006) described a sample MI-based counselor-client exchange,

...information is discussed through motivational interviewing by first *eliciting* the person's understanding and information needs, then *providing* new information in a more neutral manner, followed by *eliciting* what this means for them with a question like, "How do you make sense of all this? Motivational interviewing practitioners avoid persuasion with "predigested" health messages and instead allow clients to process information and find their own personal relevance. To this end, the guideline "elicit-provide-elicite" has been proposed as a framework for exchanging information in the spirit of motivational interviewing (p. 2025).

There are a few challenges to using MI with children. For one, younger children may be less aware of their PA barriers and motives so they may benefit from having parents involved in the counseling session to help voice their experiences. Second, counselors may need to use more questions than reflections with children to get them talking. Third, younger children may not benefit from MI until they are capable of forming long-term goals and experiencing ambivalence between future goals and current behavior (Erickson, Gerstle, & Feldstein, 2005).

5A's

A Four A's model (ask, advise, assist, arrange) was originally developed by the National Cancer Institute to guide physician interventions in smoking cessation. Later, the Canadian Task Force on Preventive Health Care proposed a 5 A's model (changing ask to assess and adding the agree step) to provide health care providers with an organizing framework for conducting behavioral counseling with patients (Whitlock et al., 2002). The 5 A's counseling model organizes the provider-client interaction into 5 progressive tasks ([Figure 1] Estabrooks et al., 2003, p 2915).

For the "assess" task, practitioners can use paper and pencil, verbal, or computerized screening tools to inquire about patients' physical activity habits in order to

compare against current recommendations. This screening should also evaluate PA contraindications and preferences. For the “advise” task, practitioners can link physical activity health benefits with patients’ known disease risk. For example, if a patient has been diagnosed with Type 2 diabetes, the practitioner may describe how PA can reduce diabetes symptoms and improve disease management. Furthermore, practitioners can prescribe the type, amount, and intensity of PA recommended for the patient’s unique health history. For the “agree” task, the practitioner and patient work together to develop an action plan for initiating or increasing PA by setting goals and planning activities based on patient preferences, and health and exercise history. For the “assist” task, the practitioner and patient discuss potential barriers and ways to overcome them, select self-management strategies such as establishing social support and rewards, and identify community resources such as community center fitness classes, walking groups, etc. For the “arrange” task, the practitioner will outline follow-up visits, referral to an exercise specialists or health educator, referral to a community PA facility or program, and/or extended support such as mailed tips or newsletters and phone counseling (Whitlock et al., 2002).

The 5 A’s tasks can be conducted by various providers and using interactive behavioral counseling technologies (IBCT [Glasgow et al., 2004]). For example, a receptionist or a practice-wide health educator might conduct the assess task using a paper and pencil screening tool or a computerized screening kiosk or PDA and can also perform the arrange tasks to provide follow-up support. The advise, agree, assist tasks can be conducted by nurses, physicians, health educators, or exercise specialists during

the health care visit or as a follow-up to the health care visit through a referral appointment or an internet-based group counseling session such as a webinar (Whitlock et al., 2002).

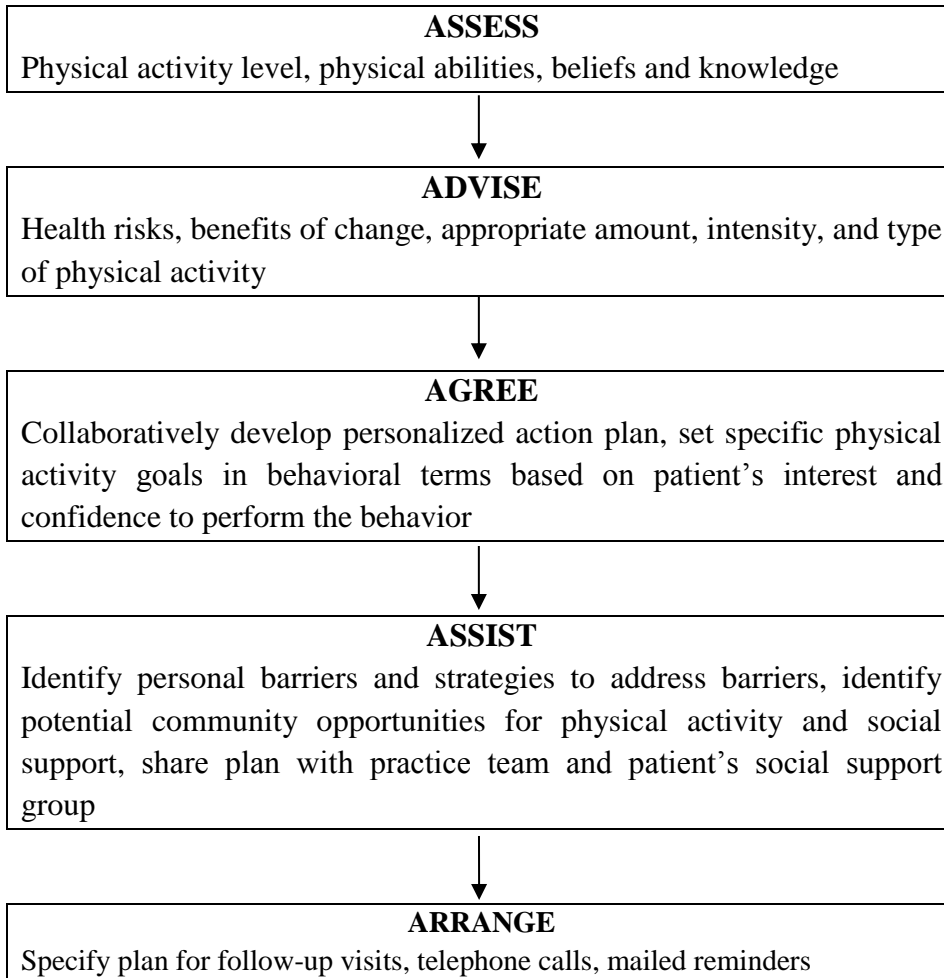


Figure 1. Tasks in 5 A's counseling.

Social Cognitive Theory

While some primary care-based PAI use a counseling approach/model like MI and 5 A's as their organizing framework, other interventions additionally or alternatively

utilize a broader behavior change theory/model like TTM or SCT. Social Cognitive Theory evolved from Social Learning Theory and stimulus response theories to explain that behaviors are influenced by reciprocal interactions among the person, environment, and the behavior. This relationship, called triadic reciprocity, describes how the person, environment, and behaviors operate as interacting determinants of each other (Bandura 1986). Each of these constructs can work in a bidirectional manner, acting at the same time as a stimulus, a response, and a reinforcement (Bandura, 1977). Environment factors include the physical (e.g., weather, access to walking areas, etc.) and social environment (e.g., social support) while perception of the environment or situation represents a person factor. Specifically, social situation is an SCT factor that describes an individual's perception of their environment and the evaluation of their interaction with the social environment. Social situation provides a set of social norms or standards by which behavior can be judged. These social norms are considered alongside general (e.g., national guidelines) and personal standards (e.g., cultural preferences). In health behavior change research, the immediate social situation (i.e., friends and family) often plays a stronger regulatory role than general or personal standards. Social situation can be a useful factor in behavior change interventions by encouraging participants to seek social interactions for support and accountability. In addition to social situation, other person factors include self-efficacy, self-regulatory capacity, behavioral capability, outcome expectations and expectancies.

Social Cognitive Theory underlies many health behavior interventions because it outlines a wide range of person factors that can be modified and measured. Among these

factors, self-efficacy has received the greatest attention. Self-efficacy refers to “beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments” (Bandura, 1998, p. 3). It is a powerful determinant of behavior because high self-efficacy can help individuals overcome strong environmental barriers such as lack of social support or behavioral barriers such as level of difficulty or intensity. Furthermore, self-efficacy for one behavioral domain can be generalized to related behavioral areas such that multiple positive health behaviors may be reinforced (e.g., nutrition and PA). Bandura (1997) described three dimensions of self-efficacy: level, strength, and generality. The level of self-efficacy reflects whether individuals are confident they can achieve simple tasks, moderately difficult tasks, or the most difficult tasks. The generality of self-efficacy reflects whether individuals are confident in their ability to achieve an isolated task or whether their self-efficacy generalizes to other related tasks. The strength of self-efficacy refers to the individual’s task confidence when significant barriers are present. Bandura (1997) described how people develop self-efficacy by interpreting information from four sources: mastery experiences, vicarious experiences (i.e., observational learning), verbal persuasion, and emotional states (e.g., anxiety, excitement) evoked by a behavior. For example, if a behavior evokes fear for an individual, this may lower their perception that they can handle the behavior successfully. Health behavior interventions that seek to enhance domain self-efficacy use counseling, learning experiences, and skill development.

The second major person factor that informs many health behavior interventions is self-regulatory capacity which is the ability to direct one’s actions toward a distal

outcome. Self-regulatory capacity includes tasks such as self-observation, judgmental processes, and self-reaction. Self-observation (i.e., self-monitoring) helps individuals regulate behaviors by supporting realistic goal-setting, monitoring progress toward these goals, and identifying barriers to overcome. Judgmental processes describe how individuals set behavioral goals and evaluate goal attainment based on achievement of expected outcomes (e.g., regular exercise will lead to weight loss) and positive or negative reinforcement (i.e., rewards or punishment). Self-reaction is how individuals react to these judgments which may lead to adjusting the behavior or extinguishing the behavior if the expected outcome is not achieved. The self-regulatory skills commonly used in health behavior interventions include goal setting, self-monitoring, self-evaluation against referential norms (one's prior attainments, others attainments, or recommendations), establishing incentives, and developing cognitive guides for a behavior (Bandura, 1986).

The third person factor, behavioral capability, is an individual's knowledge and skill to perform a given behavior. Health behavior interventions may enhance behavioral capability through didactic and skill instruction (e.g., how to read nutrition labels for weight management).

A fourth person factor, outcome expectation, is the probabilistic outcome one expects from a desired behavior. Slightly different from outcome expectations is the SCT factor of expectancies which are the values one has for those probabilistic expected outcomes. Positive outcome expectations motivate an individual to engage in a behavior while negative ones will disincentivize individual's behavior. Outcome expectations can

also be physical, social, or self-evaluative (Bandura, 1986). For example, physical activity that is too vigorous and fatiguing may produce negative, physical outcome expectations that reduce an individual's motivation to engage in future behavior. Social outcome expectations reflect the approval or disapproval one receives from peers to engaging in a behavior. Individuals express self-evaluative outcome expectations when they compare the expected outcomes with personal standards in order to decide whether to engage in a behavior. For example, if an individual has personal standards against gaining muscle size, they may have negative self-evaluation outcome expectations for strength training. Expectancies reflect the values we have in regard to the expected outcomes so the two factors together produce a multiplicative function in predicting behavioral engagement. For example, an individual may have positive outcome expectations for PA but low expectancies or value (especially compared to alternative sedentary activities such as tv viewing) leading to only modest motivation for engaging in PA behavior.

Behavior factors are not specifically designated, rather the behavioral domain is reflected in the effect that behaviors have back on the environment or the person (Bandura, 1986). For example, an individual increase their exercise behavior, specifically in running. This change in behavior leads to a new personal best time in a running event. In turn, the individual has greater self-efficacy in their exercise and running ability.

In youth, the SCT factors that show the strongest correlation with PA levels are self-efficacy and social situation. Strauss and colleagues (Strauss, Rodzilsky, Burack &

Colin, 2001) examined the relationship between the SCT factors of self-efficacy, social influences (i.e., social situation), and health belief (i.e., outcome expectations) and self-reported PA levels in youth aged 10-16 years old and found that only self-efficacy and social influences were significantly correlated with vigorous PA. Trost and colleagues compared PA correlates related to self-efficacy, social norms, and outcome beliefs and PA levels measured objectively by accelerometry in 6th graders (Trost et al., 2002). For boys, PA self-efficacy, PA-related social norms, and involvement in community PA organizations (e.g., recreation leagues) were significant predictors of PA; while among girls, only PA self-efficacy was correlated with PA levels. According to Trost and colleagues (1999), interventions can increase PA self-efficacy with programs that:

- provide enjoyable, developmentally appropriate activities that enable all participants to experience success
- create opportunities for youth to observe influential others (e.g., teachers, coaches, parents, and peers) perform physical activity
- verbally encourage children to participate in physical activity (i.e., you can do it)
- reduce any anxiety associated with participation in physical activity by significantly reducing or eliminating competition

Transtheoretical Model

Among the theories used in PAI studies in the health care setting, TTM is on one of the most prevalent. The TTM was originally proposed as a self-change model examining the different cognitive and behavioral change processes that smokers utilized at different

levels of behavioral change readiness (Prochaska and DiClemente, 1983). The refined model integrates four key constructs that were adapted from other theories and models: Stages of Change, Decisional balance, Self-efficacy/Temptation, and Processes of Change. The Stages of Change serve as the central, unifying construct of TTM while the other constructs are situated along the Stages of Change continuum (Velicer et al., 1998).

The Stages of Change describes individuals' intentions to change as they move through 5 stages of behavioral readiness. This movement can be unidirectional as individuals gain momentum and move forward with active change or experience regression or relapse (Marshall & Biddle, 2001). These stages include precontemplation, contemplation, preparation, action, and maintenance. Based on the original Prochaska and DiClemente (1983) model, during precontemplation, individuals are not aware that they need to change or are unwilling to change within the next 6 months. They lack or avoid information about the risks of their behavior and consider the drawbacks (i.e. cons) of changing unacceptable. Tailored interventions for individuals in precontemplation might include education to increase knowledge of the benefits or pros of a particular behavior change. During contemplation, individuals are increasingly aware of the risks of their behavior and begin to consider the pros and cons of changing (i.e., Decisional Balance) and plan to change within the next 6 months. However, they may experience change ambivalence if the cons outweigh the pros of change and remain in contemplation for much longer. Tailored interventions can help individuals work through the pros and cons of changing. During preparation, individuals are ready to change in the next month. In this stage they are gathering information and making plans for change, and may have

already initiated small changes but not yet met the recommended threshold for that behavior. Tailored interventions facilitate the initiation of the new behavior and may introduce social and cognitive support structures for this new behavior through early behavioral processes of change. During the action stage, individuals have initiated formal behavioral change within the past 6 months. To formally move from preparation to action, individuals must meet a behavioral criterion that reflects expert recommendations for that behavior. For example, they would meet physical activity recommendations to perform 150 minutes of aerobic conditioning per week. During the maintenance stage, individuals have successfully modified their behavior for more than 6 months and are actively overcoming temptations and barriers to change. This brief description of the stages of change hints at the myriad factors that determine how individuals move through the stages. These factors are described through the TTM constructs of Decisional Balance, Processes of Change, and Self-efficacy/Temptation which are evident in varying degrees at each stage of change.

The Decisional Balance construct outlines the balance of pros and cons of changing behavior at each stage (Velicer, DiClemente, Prochaska, & Brandenburg, 1985). The relationship between stage and decisional balance varies for negative (e.g., smoking) and positive (e.g., physical activity) behaviors, but is generally the same for both through the first 3 stages. During precontemplation the cons of changing physical activity behavior outweigh the pros while in contemplation pros and cons are generally balanced. The individual moves toward preparation as the pros of physical activity begin to outweigh the cons. In the later stages, the pros of physical activity continue to remain high while

the cons drop in a linear fashion (Velicer, Prochaska, Fava, Norman, & Redding, 1998). Tailored interventions can offer stage-specific processes of change to help people alter their decisional balance and address behavioral change motivators and barriers.

The Processes of Change construct describes useful strategies that individuals can employ to help them move toward behavioral change. These processes are divided into experiential processes, which are more prevalent in early stages as individuals are gathering information to alter their decisional balance schema; and behavioral processes, which are more prevalent in later stages as individuals identify and embrace change motivators while identifying and removing barriers. Prochaska and DiClemente's (1983) experiential processes, with alternative labels in parentheses, include: (a) consciousness raising (increasing awareness), (b) dramatic relief (emotional arousal), (c) environmental reevaluation (social reappraisal), (d) social liberation (environmental opportunities), (e) and self reevaluation (self reappraisal). Behavioral Processes include: (a) stimulus control (reengineering), (b) helping relationship (supporting), (c) counter conditioning (substituting), (d) reinforcement management (rewarding), (e) and self liberation (committing). In a meta-analysis on applying the TTM constructs to PA, Marhsall and Biddle (2001) confirmed that individuals use all 10 processes of change when modifying PA behaviors. Use of experiential processes peaked during the Action Stage and use of behavioral processes peaked during the Maintenance Stage (Marshall & Biddle, 2001).

Many of these behavioral processes of change help individuals overcome barriers to change. Self-efficacy (Bandura, 1977) is defined as an individual's confidence they can overcome barriers or temptations and is evident in the Self-efficacy/Temptation

construct of TTM. Self-efficacy increases and temptation decreases linearly across the 5 stages as individuals alter decisional balance and employ stage-related processes of change.

Physical activity interventions based on TTM are tailored to individuals' readiness for change by incorporating stage-related information and strategies to support altering decisional balance, enhancing change processes, and building self-efficacy. Individuals in early stages of change readiness will receive information about the pros of PA (decisional balance) such as reduced risk for mental and physical disorders, improved quality of life, and increased body image. They will be exposed to personal and social appraisal of physical activity behaviors (experiential processes of change) such as sociocultural approval (i.e., anti-bias) for active individuals. Individuals in later stages of PAI will continue to receive information on the pros of physical activity and will learn behavioral strategies for overcoming lifestyle and environmental barriers (re-engineering) such as access to a gym and identifying time in one's schedule to do physical activity. Additionally, PAI may use behavioral processes to promote social support through group exercise settings (supporting) and incentivize PA (rewarding) by providing prizes for achieving minute or steps goals, such as in corporate fitness programs.

Despite the recent popularity of using TTM for PAI studies, several criticisms of the model and its application to PA have been proposed. Bandura (1998) argued that TTM is not a true stage model because the stages of change are arbitrarily divided, often simply by degree of intention and random time periods, rather than being characteristically different from one another. Furthermore, in a true stage model,

individuals must pass through stages sequentially and unidirectionally; however this is not the case in TTM where individuals can skip or regress stages. Adams and White (2005) also criticized the use of stage-based models for PAI, citing the following reasons (p. 240):

- Exercise behavior is a complex of different behaviors, not a single behavior such as cigarette smoking.
- Determining current stage of change is crucial to intervention delivery, yet few validated algorithms are used.
- Exercise behavior is influenced by numerous external factors not considered by the TTM.
- The TTM suggests that stage progression is a significant outcome, but this is not always associated with behavior change.
- Stage-based interventions are highly complex and may require more than one level of development and evaluation.

Taken together, the constructs of MI, 5A's, SCT, and TTM are the most widely used theories/models in the primary care-based PAI literature and inform best practice strategies. In the following section, several recent, large scale primary care-based PAI studies will be reviewed to demonstrate how the previously described guidelines and theories/models are deployed.

Review of Pediatric Primary Care-based PAI

The purpose of this section is to review recent pediatric primary care-based PAI in terms of their design, efficacy, and feasibility; and to summarize the limitations, best practices, and future direction for PAI literature. Design parameters include type of provider, provider training, intervention strategies, and study duration. To evaluate intervention efficacy, PA outcome variables are reported. To examine feasibility, provider and participant evaluations of ease of use (i.e., fit into practice), participant recruitment, and adherence rates are reported, when available. Finally, limitations, best practices, and future directions are examined to inform the development of a PAI training program for pediatric residents. The studies on normal weight and overweight/obese patients are reviewed separately since their purpose and design were typically different.

Physical Activity Interventions in Normal Weight Youth

Most PAI studies addressed multiple health behaviors such as nutrition and PA. Additionally, the majority of PAI address adolescents because they are more autonomous than children in creating their own PA opportunities rather than relying on parents (Rowland et al., 2007).

Ariza et al. Ariza and colleagues (Ariza et al., 2005) published the only identified pediatric primary care PAI for children; however, it also targeted infants, toddlers, and adolescents. This pilot study was conducted to assess the feasibility of enhanced office systems for assessing, documenting, and counseling on family nutritional and physical activity patterns. The investigators educated physicians and staff to use growth charts, chart prompts, and handouts to promote the assessment and counseling of nutrition and

PA. The project was conducted in 4 diverse pediatric practices. A team of nutrition experts developed culturally-sensitive and age-appropriate handouts containing advice on parental modeling, physical activity, dietary practices, and television viewing to guide and reinforce physician counseling recommendations. Three economically and racially diverse focus groups were conducted to assess reactions to the proposed handouts. The focus groups' comments were audiotaped, transcribed, and reviewed for content.

Cross-sectional evaluations were conducted pre and post-intervention to measure office systems processes, care delivery, and parental responses, but only parental focus group responses to handouts were reported. Furthermore, no objective PA data was collected. The PA related responses revealed that parents were aware of recommendations such as modeling PA for their children but lacked manageable strategies to overcome barriers. Many parents responded that handouts and counseling should describe health consequences of physical inactivity; however, children are less likely to respond to health consequence messages so using this strategy for children or when the child and parent are counseled jointly needs further evaluation. Parents also felt that reminding them that they are role models for PA may enhance their motivation to make behavior change. Finally, some parents suggested that handouts should be more sensitive and were opposed to language that suggested getting sweaty.

Healthy Teens. Olson and colleagues (Olson et al., 2005) conducted a primary care intervention targeting improvements in PA, nutrition, tobacco, and risky alcohol use for adolescents ages 11-20 years of age at 5 rural practices. A control group of usual-care participants was recruited at well-child visits prior to the intervention. One year later (to

account for season effects on PA) the Healthy Teen intervention participants were recruited at well-child visits after the Healthy Teens system was well established in the practice. All participants were assessed at baseline and 6 months after their well-child visit. The Healthy Teen intervention included: (a) provider training in brief motivational-interviewing techniques, (b) a personal digital assistant (PDA) tool used in the waiting room that screened for participants' health behaviors, interest in making change, and their perceived importance and confidence in making various behavioral changes, (c) PDA-based prompts reminding the provider to use a motivational-interviewing approach, and (d) and community resource information for practices and adolescents. Office staff received a brief training on PDAs to be able to initiate patient use in the waiting room. Physician providers received 3 hours of interactive training from a health psychologist on motivational interviewing techniques such as reflective listening, addressing ambivalence, and goal setting. Physical activity behavior was self-reported days in the past week when moderately active for 30 minutes or more. Health behavior change scores were calculated for each participant behavior by subtracting baseline from 6-month responses.

At 6-month follow-up, the intervention group significantly increased self-reported PA levels. Intervention group status ($P = 0.009$) and post-visit interest in making a change ($P = 0.015$) were significant predictors of improvement in PA levels. When teens planned an action related to nutrition, physical activity, or both after a well-child visit, intervention participants were more likely to report multiple planned actions (68% intervention versus 32% usual care, $P < 0.05$).

Health care providers completed a survey to assess their perceived counseling skills and roles prior to and 18 months after the Healthy Teen implementation. Providers were asked their level of agreement with statements using a 5-point scale (1=strongly agree to 5=strongly disagree). Post-surveys included additional items pertaining to motivational-interviewing skills and PDA implementation. Perceived confidence in these skills and the use of a PDA were assessed post-intervention only. While their views of counseling roles and effectiveness were unchanged, the providers found health counseling easier and thought that they listened better. The majority of all providers perceived that use of the PDA enhanced their visit and expressed confidence in new motivational-interviewing skills 18 months after training. In addition, 75% of the post-survey respondents reported that they definitely planned to continue using the PDAs.

Ortega-Sanchez et al. Ortega-Sanchez and colleagues (Ortega-Sanchez et al., 2004) conducted a year-long PAI in 6 family physician practices in Spain to examine whether patients' current PA level increased following physician advice during an office visit. Participants were adolescents 12 -21 years old and were assigned on an alternating basis to an age and gender matched control or intervention condition. Each participant was classified as active (moderate to vigorous PA ≥ 3 days/week for ≥ 30 minutes/day), partially active (moderate to vigorous PA < 3 days/week or for < 30 minutes/day, or at a mild intensity), or inactive (no PA or sport) based on how they answered verbal questions about their physical activity and sport participation in and outside school. Activity in physical education classes was not counted since in Spain these classes are used to teach sports rules and methods. Physician-delivered personal counseling was provided to all

intervention participants using an “Ask, assess, and advise” model. Physicians received written guidelines but no hands on training on how to implement this model for each of the 3 activity levels. Intervention participants in the active, partially active, and inactive levels received reinforcement, increase, or initiation counseling, respectively. Table 5 summarizes the personal counseling guidelines for each of the baseline activity levels.

Table 5.

Counseling Guidelines for Activity Levels in Ortega-Sanchez et al.

Activity Level	Counseling Type	Ask, Assess, Advise Counseling Guidelines
Active	Reinforcement	(a) Offer congratulations for healthy lifestyles. (b) Explain the health benefits provided by lifelong exercise and/or sport. (c) Encourage continued participation in exercise and/or sport.
Partially Active	Increase	(a) Explain the health benefits provided by lifelong exercise and/or sport. (b) Explain the conditions that exercise and/or sport practice should satisfy to be useful for health maintenance. (c) Point out the frequency, duration, and/or intensity condition not satisfied. (d) Provide guidance as to how to accomplish it.
Inactive	Initiation	(a) Explain the health benefits provided by lifelong exercise and/or sport. (b) Encourage initiation of exercise and/or sport. (c) Explain the frequency, duration, and intensity required for the exercise and/or sport chosen.

Identical procedures were repeated at 6- and 12-month office visits. Changes in duration, frequency, and intensity of PA and/or sports were assessed at each visit. For analysis, the partially active and inactive group were collapsed (and called inactive) and compared to the active group. The intervention group increased its proportion of active adolescents to 31.0% ($P = 0.010$) at the 6 month visits and to 41.5% ($P = 0.001$) at 1-year visits. In comparison, the control group decreased its proportion of active adolescents to 12.5% ($P = 0.251$) at 6 months visits and to 9.1% ($P = 0.411$) at 1-year visits. Statistically significant between-group differences in the proportion of active adolescents occurred over time ($P = 0.002$ for trend), with greater between-group differences observed at 1 year vs. 6 months.

These results suggest that frequent follow-up counseling is important. Furthermore, follow-up counseling may be more salient when provided by the physician or the practitioner who provided the initial personal counseling rather than a researcher as seen in other studies. In support of this theory, Rowland suggested that a better model may be for physicians to lend their credibility to refer patient to a PA specialist or counselor who can manage initial and follow-up counseling sessions (Rowland et al., 2007).

The success of this intervention may also reflect the nature of Spain's health care system where patients can see a physician more often and physicians consistently provide behavioral counseling interventions. This intervention demonstrated that PAI are more effective if counseling interactions are repetitious. These results; however, are not

generalizable to the US health care system which does not support such frequent well visits and leaves limited time for behavior counseling interventions in a typical well-child visit. The investigators suggested that their intervention was superior to the Healthy Teen and PACE+ interventions because it did not rely on expensive technology, in-depth provider training, or support staff (e.g., receptionist, researcher) for assessment and extended counseling. However, in the US, these supplemental components might be necessary because the frequency of well-child visits and duration of appointment times are so limited. The next section reviews PAI that include PA counseling conducted by physicians during the well-child visit as well as follow-up extended counseling that is provided by allied health care providers.

PACE+. One of the most comprehensive pediatric primary care-based PAI was called Patient-Centered Assessment and Counseling for Exercise plus Nutrition (Patrick et al., 2001 [PACE+]; Patrick et al., 2006). This intervention included physician-delivered personal counseling during the well-child visit and extended counseling delivered by researchers. The participants were adolescents, ages 11-18 years old, recruited from four pediatric clinics. The intervention consisted of 3 components: (a) a computerized screening and behavior change program, (b) practitioner-delivered personal counseling (i.e., physician or nurse practitioner, and (c) 3 different conditions of extended intervention via telephone or mail.

While in the waiting room for a routine well-child visit, adolescent participants completed an interactive, computerized program that screened for moderate to vigorous physical activity (MVPA), fat consumption, and fruit and vegetable intake. Physical

activity was assessed by asking the number of days that the participant completed 20 minutes or more of vigorous activities or 30 min or more of moderate activities and included examples of activities that exemplified each of these intensities. The program then provided a health profile comparing current behaviors with health guidelines. Participants were encouraged by computer prompts to make a plan to change 1 PA and 1 nutrition behavior. Once the behaviors were selected, the computer guided the participant to identify motivators and to develop a personalized behavior change plan that reviewed benefits of change and involved goal-setting, change strategies such as times and places for behavioral change, social support, problem solving, and anticipating and planning for barriers. Practitioners delivered brief personal counseling based on a 1-page provider summary of the health behavior profile and plan and asked the patient to sign a behavioral contract. The computer program and personal counseling encouraged parental involvement but each adolescent participant determined the amount of parent involvement. All participants received the same in-office care (computer screening and personal counseling) and then were randomly assigned to one of three extended intervention groups that lasted for 4 months: (a) mail only, (b) infrequent telephone and mail, or (c) frequent telephone and mail. Mailings included written materials providing PA tips that were age and goal-appropriate. Research staff conducted personal counseling calls in which they reviewed goal progress, provided reinforcement, addressed barriers, and encouraged participants to seek social support.

At baseline, 39% of participants reported meeting the guidelines for moderate physical activity (30 minutes, 5days a week), 74% for vigorous physical activity (20

minutes, 3 days a week). Following the PACE+ intervention, vigorous activity increased by 10% ($P = .07$), and moderate physical activity increased by 17% ($P = .01$). There was no difference in PA by extended intervention group. When examining the change in targeted behaviors compared to un-targeted behaviors, there was a moderate effect size ($d = .60$) for moderate PA, and a small effect size ($d = .20$) for vigorous PA. Of note, vigorous PA was relatively high at baseline so there was less room for change. The investigators suggested that there was no difference among the extended intervention groups because the content of the extended support may be more important than the frequency. Although there was no control group, researchers pointed to the moderate effect size for targeted behaviors compared to untargeted behaviors as evidence that participant generated goals and change plans, supported by provider counseling, was an efficacious approach to increasing PA.

Investigators assessed the feasibility of PACE+ by asking participants to rate their satisfaction with the computer program and counseling at 1 week and their satisfaction with the mailing and phone components at 4 months. Adolescents expressed generally high satisfaction with all components of the intervention (3-4 on 5 pt Likert scale). They rated the computer program and personal counseling components as most helpful in making behavioral changes, and the mailed materials as least helpful. About 75% of the adolescents were satisfied with the frequency of both the mailed materials and telephone calls, and only 10% stated that contacts should be more frequent. Parents gave very high overall ratings of satisfaction, and 98% said that PACE+ should be routinely offered at the clinic.

In a follow-up study (Patrick et al., 2006) PACE+ investigators conducted a subsequent PAI on adolescents ages 11-15 years old who were randomized to the PACE+ intervention design or a similarly constructed (i.e., computer-based assessment and plan and provider counseling on sun habits) sun protection behavioral program for control participants. Similar to the previous PACE+ study, this intervention addressed physical activity and nutrition behaviors and consisted of the usual computer-based program for assessment and development a behavior change progress plan for 1 PA goal and 1 nutrition goal (described in detail above), practitioner (i.e., physician and nurse practitioner) counseling, and an extended intervention (led by researchers) of one year of stage-matched mail and phone support. The assessed PA behaviors were time spent in moderate PA, vigorous PA, and sedentary behaviors. This study also measured time spent in sedentary behaviors because of evidence indicating that extinguishing sedentary behaviors may be more feasible for individuals than adopting active behaviors and that a reduction in sedentary habits may be more effective in reducing obesity (Epstein et al.,1995). During the first 6 months of the extended intervention, calls were centered on the 1 PA and 1 nutrition behavior that the participant chose to target at their initial visit. At 6 months there was a visit for measurement and staging for selecting 2 new behaviors to target, and a new progress plan. Subsequent calls were directed at these new target behaviors and the associated progress plan. At the initial visit, the intervention group also received written materials (i.e., the Teen Guide) that contained 16 sections on specific target behaviors, theory-based behavior change strategies (e.g., self-monitoring, decisional balance, etc.) and worksheets so adolescents could apply the learned strategies.

Additionally, there was a parent intervention to help parents encourage behavior change attempts through praise, active support, and positive role-modeling. Figure 2 represents the PACE+ intervention components.

Outcome measures were collected by a researcher at baseline, 6 months, and 12 months via in person or phone interviews. Physical activity related outcome measures included minutes spent in moderate or vigorous as measured by 7 day PA recall and 7 day accelerometry (measured at 6 and 12 months only) and minutes spent in sedentary behaviors measured via self-report of recent school day and non-school day time spent watching television, playing computer/video games, sitting talking on the telephone, and sitting listening to music.

The only significant effect for both boys and girls was a reduction in sedentary behaviors. In addition, boys in the PACE+ group increased their number of active days per week ($P = .01$) compared with control participants. These two studies, taken together, suggest limited effects of provider counseling on generally healthy adolescents seen in primary care, even when it is supported by an intervention like PACE+. The authors suggested that more intensive interventions, perhaps using a “stepped care” approach that varies the intensity of the intervention, may be more efficacious. This intervention was shown to be feasible in that nearly two-thirds of intervention participants completed all phases, including the extended intervention.

Obesity Interventions with a PAI Component

Although obesity treatment is not the focus of this review, several strong randomized controlled trials will be reviewed because they utilized PAI strategies in the

primary care setting. Obesity is caused by a consistent imbalance between energy intake and energy expenditure leading to the storage of excess energy in the form of adipose tissue. To increase the energy expenditure side of the caloric equation, PA is an essential component of pediatric obesity treatment, along with dietary and behavior change strategies (Lemura & Maziekas, 2002). Studies have demonstrated that, similar to physical activity levels, obesity in childhood tracks into adulthood (Lemura & Maziekas, 2002). Lemura and colleagues (2002) conducted a meta-analysis of pediatric obesity treatment programs in various settings (family, health care, community, etc.). The PA parameters that were most effective in reducing fat and increasing fat free mass in overweight/obese children were low intensity and long duration aerobic conditioning, a combination of aerobic plus high-repetition (8-12 repetitions) resistance exercise, and an intervention of exercise plus behavior modification.

Similar to the PAI studies described previously, no obesity treatment interventions address PA exclusively, rather they seek to increase PA while decreasing sedentary behaviors such as tv viewing, and improve nutrition. Unlike the mix of primary care only and primary/extended care interventions in the PA promotion studies, the obesity treatment studies exclusively employ the dual primary/extended care approach. Furthermore, the control conditions in these studies often received “typical care” which involved obesity assessment and counseling on dietary, PA, and sedentary behavior change strategies. Although this form of typical care is consistent with American Academy of Pediatrics recommendations, it is rarely seen in standard practices (Glasgow et al., 2001). Therefore, most of the control conditions in these studies received enhanced

care compared to real world practice, which may dampen any differences in the intervention condition. Furthermore, this enhanced care resembles the intervention models seen in the primary care only PAI studies. For all obesity treatment studies, inclusion criteria included BMI >85% but less than a BMI z score of 3 at which point a brief , primary care intervention is not indicated in favor of a more comprehensive outpatient care program.

LEAP trial. In the Live, Eat, and Play trial (McCallum et al., 2007[LEAP]) participants 5 to <10 years old were recruited from 29 family practices in Melbourne, Australia. The practitioners were all general physicians. Across 3 evening group sessions, practitioners received a standardized education package including didactic and reflective teaching regarding childhood obesity and training in brief solution-focused therapy techniques which encourage the provider to explore the patient's own lifestyle behavior change solutions to lead to adoption of achievable and realistic goals. Practitioners practiced in role play with simulated families. Participants were included in the study if they were overweight to mildly obese based on BMI screening and their parents completed the informed consent and baseline questionnaire. Participants were randomly assigned to an intervention or control condition.

Prior to the initial participant visit, investigators provided the physician with the participant's personalized intervention materials (called the Family Folder), BMI, and parent responses regarding relevant health behaviors (nutrition, PA, etc.) from the baseline questionnaire. Investigators used an intervention mapping approach to identify the participant's behavioral determinants of obesity (including PA); and barriers and

facilitators of change for each behavior. This information was translated into the personalized Family Folder that included a topic sheet for each behavior with evidence regarding the importance of that behavior in modifying obesity risk, modeled solutions to barriers, and additional suggestions for how to change behaviors. Parents were asked to attend four primary care visits with the physician over a 12 week period. These individual consultations utilized the brief solution-focused approach to address obesity related behaviors detailed in the Family Folder.

The primary outcome measure of BMI was assessed at baseline, 6 months, and 12 months following completion of the 12 weeks of consultations. Secondary outcome measures of PA and dietary habits were assessed at 6 months and 12 months post-consultation. PA was measured using the validated Bouchard after-school activity diary. With this instrument, proxy daily activity scores were calculated from parent ratings of children's activity on a scale of 1 (sedentary) to 7 (intense activity) at 15 min intervals between 3:30 and 6:30 pm over 4 days. Children's activity was also dichotomized into percentage of time spent in low-level activity (ratings 1–3) versus higher level of activity (ratings 4–7, reported as percentage time spent in moderate–vigorous activity) in order to calculate time spent in MVPA. At 6 months post-consultation there was a significant ($P = .05$) increase in percentage of after-school time spent in moderate–vigorous physical activity. This increase was not sustained at 12 months post-consultations ($P = .29$).

In a subsequent LEAP 2 trial, a similar design was implemented with a few methodological improvements in provider training and outcome measures. In addition to the evening group training sessions for physicians, they also received a 30 minute dvd

showing role model scenarios of providers using solution-focused therapy. Additionally, each provider conducted a simulated initial consultation and follow-up consultation with actors portraying parents and received feedback and a score from researchers. Physicians could not participate in the intervention until they received a specific score, which all but two providers achieved on the first attempt. Similar to LEAP, the LEAP 2 primary outcome was BMI (measured at baseline, 6 months, and 12 months post-consultations) and the secondary outcomes were PA and dietary behaviors measured at 6 months and 12 months post-consultations. To assess PA, parents completed the proxy after-school activity diary as described above. Additionally, children wore an accelerometer during all waking hours for 7 days. Accelerometry data was translated into mean activity counts per minute and percentage of time spent in MVPA. There was no significant improvement in BMI or even difference in BMI increase over the 12 month duration of study. Accelerometer-measured activity counts per minute was slightly but not significantly higher in the intervention than control group at six months ($P = .09$) and was not significantly different at 12 months ($P = .55$). There was no difference in accelerometer-measured MVPA ($P = .20$). Proxy activity diary scores showed a slightly but not significantly greater amount of time spent in high versus low activity in the intervention group ($P = .08$).

The results of obesity treatment interventions of the LEAP and LEAP 2 trials should be considered in light of the participants' overweight/obese status. Lemura and colleagues (2002) reported that low intensity and longer duration PA was more effective for PA obesity treatment perhaps because this intensity was more manageable for the

overweight and obese population. It is possible that the way the PA data was translated to MVPA was not as sensitive to low intensity PA; however, the increase in accelerometer-measured activity counts/minute in the intervention group does suggest that there may have been an increase in low intensity activity in the intervention group. Measurable improvements in low intensity PA in short-term studies might be clinically meaningful for this population because it may allow participants to build fitness and tolerance for moderate and vigorous PA in the long-term. Another consideration for this population is that obese participants might be more resistant to PA changes due to unique barriers like low PA self-efficacy, orthopedic or muscular discomfort during PA due to excessive weight, and lower baseline PA levels compared to non-obese. Therefore, near significant findings in the obese population may predict a stronger effect in a non-obese group that doesn't have these barriers. On the other hand, it can be argued that obese participants and their parents would be more motivated to change behaviors because of the health risks of their weight status.

Healthy Habits. Saelens and colleagues (Saelens et al., 2002) implemented the Healthy Habits program in two pediatric practices using the PACE+ protocols adapted for an overweight pediatric population. Adolescents ages 12 to 16 years old were assigned to either the Healthy Habits (HH) intervention or typical care (TC) which was a single session of physician counseling during a well-child visit. During their well-child visit, physicians counseled TC adolescents on health consequences of overweight and benefits of weight management, reviewed nutrition and PA recommendations, and encouraged participants to adopt behavior change strategies. Healthy Habits participants completed

baseline assessment followed by computer-based assessment and behavioral planning immediately prior to a primary care visit. This modified version of the PACE+ computer program was utilized to assess eating, physical activity, and sedentary behavior and guide adolescents to develop personalized plans to increase PA or decrease sedentary behavior, and to decrease dietary fat, increase fruits/vegetables, or decrease overeating/snacking. The computer-based plan involved identifying benefits, barriers, and specific strategies to achieve goals and then developed a printed action plan for the adolescent and summary for the provider. The HH participants then received tailored counseling from their physician during their well-child visit and telephone counseling, conducted by a research assistant, weekly for 8 calls and then biweekly for the last 3 calls. Following the physician counseling session HH participants received a manual on behavioral skills with additional sections mailed to participants after the fifth, eighth, and tenth calls. This manual was referenced during calls to help participants generate strategies for meeting goals. Their parents received mailings reviewing strategies such as environmental control and positive reinforcement to promote adolescent's behavior change. Beginning at the fifth call, HH adolescents were encouraged to self-monitor PA daily and to gradually progress to the goal of 60 minutes of at least moderate intensity physical activity on 5 days per week. Participants were counseled to increase enjoyable activities, try new activities, and replace sedentary activities with active ones. Physical activity was assessed at baseline and 4 months with the Seven-day Physical Activity Recall (PAR) interview which is used to estimate kilocalories burned per kilogram of weight per day. There was a significant difference when comparing pre to post BMI z scores such

that HH participants' BMI went down slightly while HH participants increased. There were no differences between groups on any of the behavioral variables (PA, dietary, etc.). Post-treatment, HH participants and parents reported significantly higher use of behavioral skills (self-monitoring, etc.). The researchers suggested that real differences in PA levels and dietary intake between the 2 groups might have been concealed if HH participants, were more accurate on their recall because they were practicing self-monitoring.

KidSTRIVE. The Kids Striving to Improve Diet and Exercise (KidSTRIDE [Ewing et al., 2009]) pilot intervention was conducted in 2 pediatric practices using physicians, nurse practitioners, and nurses. Physicians and nurse practitioners provided brief motivational-based counseling and referral to the intervention program during well-child visits. The researchers and nurses conducted the actual intervention program for referred children, which ran for 5 months and consisted of 8 weekly group meetings followed by 3 monthly individual meetings for the parent-child dyads. Brief individual coaching for each participating parent-child dyad also occurred during each weekly session.

These providers received both education and skills training from researchers. Physicians and nurse practitioners received a 30-minute self-study packet that reviewed the health consequences of pediatric overweight and evidence of effective weight interventions for children aged 8-12 years old. Providers also participated in two, one-hour face to face training sessions with researchers to learn about stages of change, practice motivational interviewing skills, making recommended behavioral changes, and

referral to the intervention program. Nurses were educated in behavioral theory and weight management principles. They were then trained to deliver the manualized intervention through an apprenticeship model whereby the researchers conducted the first wave of participants while nurses observed and participated in the weekly individual dyad meetings. As the nurses demonstrated mastery over the concepts and skills needed to deliver the full intervention, they took over exclusive management of group and individual meetings.

During the weekly group meetings parents and their child met in separate groups and then came together for 15 minutes of individual counseling. The group meetings focused on dietary and PA behaviors and behavior change strategies such as self-monitoring of daily food intake, physical activity and sedentary behavior, and positive reinforcement. Both the child and adult meetings reviewed instruction about the nutritional value of foods, appropriate portion sizes, and the use of the Stoplight Food Reference Guide. Additionally, parents were counseled in effective parenting strategies to support their child's behavior changes. The feasibility of the project was assessed through measures of attendance, compliance with self-monitoring behaviors by the children, changes in weight and BMI, and parent satisfaction. PA was measured using pedometer data.

The KidSTRIDE study was more comprehensive than previous primary/extended care interventions by including more frequent and intensive contact. However, this intervention was conducted solely by the providers in a primary care practice and did not rely on allied health providers (nutritionists, counselors or psychologists, and exercise

specialists) such as in outpatient treatment programs. Comprehensive outpatient interventions were not considered in this review because they rely heavily on allied health services with the primary care setting serving only as a referral source. However, it is of interest to note that these outpatient interventions are numerous (i.e., most hospitals have one), well-funded, involve frequent contact (weekly to monthly), are multi-component with diet, PA, and behavior modification skills, often include fitness classes, are long in duration (6-12 months or more), and are moderately efficacious at increasing PA as well as resulting in weight maintenance or loss (Eliakim et al., 2002). These findings indicate that a model for efficacious PAI may depend on more frequent, intensive, and longer duration contact than the primary care setting can supply given the US health care structure.

Best Practices and Limitations

Taken together, these studies and pediatric guidelines support the provision of PAI in pediatric primary care. Effective PAI consistently included the following strategies: PA screening, PA prescription, PA counseling, and PA support (i.e., extended follow-up). This evidence suggests that regular follow-up, preferably from the initial practitioner who performed personal counseling, improves outcomes. Given the limitations of the health care system, tools and technology that make PA screening and counseling more efficient are warranted but should not be at the exclusion of a credible practitioner who will be more salient in providing reinforcement and accountability. Additionally, these studies suggest that PA counseling by primary care practitioners should be patient-centered,

based on motivational interviewing techniques, and provide strategic action steps to help patients overcome barriers.

None of these studies reported on fidelity, or the extent to which the PAI was implemented as intended. Furthermore, in these efficacy studies, physician training in PAI varied widely from reading a handout (Ortega-Sanchez et al., 2005) to a multi-session training with assessment of competence before physicians' administered the intervention (Wake et al., 2009). Therefore, while there is evidence-based support for a positive effect of PAI on pediatric PA levels, there is little evidence on which instructional strategies are most useful in training physicians to deliver effective PAI. Furthermore, given the diversity of PAI strategies used and the sometimes inconsistent outcomes, it is possible that less-efficacious primary care-based PAI studies may be due to poor physician training and fidelity to the intended intervention design rather than the ineffectiveness of PAI.

Prevalence and Barriers for Primary Care-based PAI

Despite established practice guidelines and evidence of positive effects for PAI, few primary care visits include PAI. Glasgow and colleagues (2001) surveyed a national sample of patients about their health care experiences in the past year to examine prevalence of various PA counseling strategies. The results indicated that 56% of patients were asked about their physical activity behaviors (i.e., screening), 28% reported receiving "advice" about physical activity from their physicians, and only 11% received any counseling about how to formulate a specific PA plan.

A few studies have measured the prevalence of PAI by surveying physicians; however, comparisons between patient and physician survey responses are limited because of inconsistent outcome measures. For example, Abramson and colleagues asked physicians to report their rate of PA counseling in 20% increments (i.e., 0-20 %, 21-40%, etc.) while Walsh and colleagues used a yes/no question to assess the percentage of physicians who provided PA counseling to at least 50% of their patients, with no justification for why they chose this 50% threshold (Abramson, Stein, Shaufele, Frates & Rogan, 2000; Walsh, Swangard, Davis, & McPhee, 1999). Nonetheless, Abramson and colleagues reported that 12% of pediatricians, 22% of geriatricians, 38% of family practitioners, and 48% of internists reported “counseling” more than 60% of their patients on “the benefits of PA”; while Walsh and colleagues indicated that 59% of family physicians and 39% of internists reported delivering PA counseling to more than 50% of patients.

Healthy People 2020 reported possibly the most accurate yet conservative estimate for the provision of PAI by primary care physicians. Healthy people 2020 PA objective 11.2 is to “increase the proportion of physician visits made by all child and adult patients that include counseling about exercise (USDHHS, 2009). The data source for this objective, the National Ambulatory Medical Care Survey (NAMCS), required physicians to complete patient record forms for a systematic random sample of approximately 30 office visits occurring during a randomly assigned 1-week period (USDHHS, 2007). From the NAMCS description, it is unclear whether physicians only “counted” PA counseling that was assigned an ICD code for behavioral counseling which might

artificially lower reported PA counseling rates given that many physician/patient interactions regarding PA counseling are not coded or reimbursed (personal communication, Dr. Karen Mangarelli, 2011). Nonetheless, the NAMCS indicated that only 7.8% of youth and 7.5% of adults received primary care-based PA counseling in 2007. Interestingly, Healthy People PA objective 11.1 which is to “increase the proportion of office visits made by patients with a diagnosis of cardiovascular disease, diabetes, or hyperlipidemia that include counseling or education related to exercise” indicates a PA counseling rate of 14.3 percent. The different PA counseling rates for healthy patients and patients with chronic disease suggests that practitioners view PA counseling as more necessary for disease treatment than as a preventive health strategy.

A major limitation of many of the surveys used to measure PAI prevalence is that they did not differentiate between the various PAI strategies. Therefore, in these studies, physicians who provided PA “advice” were not differentiated from physicians who deliver more intensive personal counseling. Future research should examine the differential provision of the various PAI strategies to identify and compare their rates of delivery and determine which strategies are most effective in increasing PA level.

In this body of research, physicians were also asked about their reasons for not providing PAI. The reported barriers included lack of PA counseling knowledge and skills, low motivation (i.e., don’t feel it’s necessary), low self-efficacy for changing patient PA level, lack of time, concerns about reimbursement, and low practitioner PA level (Rowland et al., 2007; Walsh et al., 1999). Additionally, researchers have found

that physicians who meet the PA guidelines themselves are more likely to provide PAI (Abramson et al., 2000, Lobelo, Duperly, & Frank, 2009).

Medical Education in PAI

In order to address these barriers and increase the prevalence of pediatric primary care-based PAI, there is a need for increased medical education in PAI. Garry and colleagues surveyed medical school assistant deans and found that although 61% of responding schools believed it was the responsibility of the medical school to educate their students in PAI, only 13% of responding schools actually had a PAI curriculum and of those, only 46% required it (Garry, Diamond & Whitley, 2002). Rogers and colleagues (2002) surveyed medical residents in internal medicine to assess whether they received PAI training in medical school or during their residency and the extent to which they provided PAI to their primary care patients. They found that while 96% of the residents felt it was physicians' responsibility to counsel patients on PA, 58% had not received any training in PAI in medical school or during their residency. Additionally, only 28% felt confident in their ability to prescribe PA, while 91% felt that additional training in PA counseling would be worthwhile (Rogers et al., 2002).

While medical school and residency administrators acknowledge the importance of PA I, they often lack the resources or training to provide this type of curriculum (Garry et al., 2002). Garry and colleagues (2002) suggest that medical schools take an interdisciplinary approach to providing PA-related medical education by tapping into the institution's faculty in such fields as exercise physiology, epidemiology, nutrition, public health, preventive medicine, behavioral medicine, cardiology, and sports medicine to help

advocate for and develop a PAI curriculum. Case in point, in their survey of medical school deans they found that respondents from institutions with a PAI curriculum tended to report a greater institutional emphasis on public health, which the authors speculated was a driving force in their inclusion of PAI curriculum. Unfortunately, even if schools identify experts to deliver such a curriculum, there is an extremely limited evidence-base on which to develop a new curriculum. Accordingly, there is a need in the medical education literature for the development, delivery, and evaluation of PAI curriculum. Two such studies/reports were identified, one describing a PA curriculum for medical school and the other for a residency program.

Physical Activity Intervention Curricula

Ritchie and colleagues (Ritchie, Stetson, Bass, & Adams, 2002) described a brief PAI curriculum for medical students. Their curriculum included the following content knowledge:

- review of PA mediated disease risk reduction and management
- prevalence of physical inactivity
- high risk groups for physical inactivity
- ACSM/CDC guidelines for physical activity
- Theory-based PA counseling strategies
 - Stages of change/Transtheoretical Model
 - Patient-centered approach
 - 5-A's

- Contraindications and risk stratification for starting PA
- Physical activity prescriptions for individuals with various diseases

Students were provided with an interview template that was based on the 5A's framework and utilized questions derived from the Stages of Change and patient-centered models. They were assigned to conduct a PA counseling session with a healthy participant and write it up on the interview template. No evaluation data was collected or reported.

In a subsequent study from the same institution, Bass and colleagues (2004) developed an educational intervention consisting of an interactive lecture and a standardized patient experience to provide first-year medical students with practical experience in PAI. This intervention curriculum was integrated into the Nutrition and Health Promotion section of the Clinical Practice Sciences course. It involved background readings on PA counseling models, including the patient-centered model, Transtheoretical Model, and 5 A's; as well as a didactic session which integrated lecture, discussion, and applied learning techniques such as a video of effective counseling skills, discussion cases, and counseling scripts with tips on how to address key barriers to behavior change. Immediately following the didactic session, students applied the counseling models in a simulated clinical encounter in which practice and feedback were provided in a low-threat environment.

Students completed pre and post educational assessments of attitudes, knowledge, and self-confidence with the counseling techniques. The knowledge questions were

based on content developed by local subject matter experts for the PAI lecture. These questions were reviewed by 4 Internal Medicine faculty and then pre-tested in a group of 10 residents and 10 fourth year medical students. Scores were determined by percent correct with all questions weighted equal. Fifty percent of students voluntarily returned both the pre and posttest (n=57) survey. Respondents were 60% female and 40% male which mirrored the gender distribution in this medical school class. Knowledge scores increased from 6.1 to 8.5 ($P < .001$). Self-confidence scores increased from 51 to 82 ($P < .001$). While overall attitudes regarding the necessity and utility of counseling with specific disease states were not different pre/ posttest (necessity pre/post 6.3 to 6.2, $P = .71$; utility pre/post 5.8 to 5.7, $P = .88$), necessity and utility scores for disease states treated primarily with counseling (e.g., physical inactivity, weight management) were different compared to disease states students perceive to be primarily pharmacologically treated ([e.g., hyperlipidemia, hypertension, diabetes] counseling vs. pharmacological necessity 5.9 vs. 6.6, $P < .001$; utility 5.4 vs. 6.1, $P < .001$). In other words, the first year medical students felt that PA counseling had greater necessity and utility for patients with diagnosed diseases that were actively being treated with drugs. While there is limited evidence for a positive effect of PAI medical education on practitioners' knowledge and attitudes, no studies have examined changes in practitioner PAI behaviors following such a course.

Educational Methods in Medical Education

These PAI studies also demonstrated the variety of educational methods used in medical education. Several resources are available to medical educators to determine the

appropriate educational methods to achieve the intended learning objectives. The Accreditation Council for Graduate Medical Education (ACGME) recommends that residency programs use a competency-based educational framework (Taylor & Swing, 2010). Taylor and Swing (2010) described the following characteristics of competency-based medical education: (a) explicit and aligned with expected competencies; (b) criteria-driven, (c) focused on accountability to benchmarks, guidelines, and clinical evidence; (d) grounded in “real-life” experiences; (e) fosters the learners’ ability to self-assess performance against standards; and (f) individualized, providing more opportunities for independent study.

Another helpful resource is the book *Curriculum Development for Medical Education: A Six Step Approach* (Kern, Thomas, & Hughes, 2009). This text outlines the range of medical educational methods that can be used to address cognitive (knowledge), affective (attitudinal), and psychomotor (behavioral) learning objectives. Kern and colleagues (2009, p. 75) emphasized the importance of matching educational methods to the learning objectives (Table 6).

Conclusion

In summary, PA is associated with many health benefits for youth; however youth PA levels decrease with age. Numerous medical organizations recommend that their practitioners provide PAI; yet, the prevalence of PAI is low and the effects on PA behaviors are modest, possibly due to poor provider training. PAI residency curricula should be developed using ACGME guidelines and educational methods that are matched to the learning objectives. This study seeks to address these limitations and barriers

through the development and delivery of a medical education course in PAI for pediatric residents.

Table 6.

Matching Educational Methods to Learning Objectives

Educational Methods	Learning Objectives				
	Cognitive: Knowledge	Cognitive: Problem Solving	Affective: Attitudinal	Psycho-motor: Skills or Competence	Psycho-motor: Behavioral or Performance
Readings	+++	+	+	+	
Lectures	+++	+	+	+	
Programmed learning	+++	++		+	
Discussion	++	++	+++	+	+
Reflection on experience			+++	+++	+++
Feedback on performance	+	++	++	+++	+++
Small group learning	++	++	++	+	+
Problem-based learning	++	+++	+		+
Team-based learning	+++	+++	++	+	+
Learning projects	+++	+++	+	+	+

Table 6. (continued)

Educational Methods	Learning Objectives				
	Cognitive: Knowledge	Cognitive: Problem Solving	Affective: Attitudinal	Psycho-motor: Skills or Competence	Psycho-motor: Behavioral or Performance
Role models		+	++	+	++
Demonstration	+	+	+	++	++
Role plays	+	+	++	+++	+
Artificial simulation	+	++	++	+++	+
Standardized patients	+	++	++	+++	+
Real-life experiences	+	++	++	+++	+++
Audio or video review of learner	+			+++	+
Behavioral/environmental interventions			+	+	+++

Note: Blank = not recommended; + = appropriate in some cases, usually as an adjunct to other methods; ++ = good match; +++ = excellent match

CHAPTER III

METHOD

To overcome these limitations in the primary care-based PAI research, the primary purpose of this study was to develop, implement, and evaluate a PAI training program for pediatric residents; particularly focusing on pretest to posttest changes in residents' knowledge, attitudes, and behaviors (KAB). The secondary purpose was to evaluate participants' perceptions of the instructional strategies.

For the primary purpose to assess improvement in PAI knowledge, attitudes and behaviors, both quantitative and qualitative methods were employed in an embedded mixed methods design. For the primary quantitative data, it was hypothesized that residents' knowledge and positive attitudes related to PAI would improve following the training program. For example, Bass and colleagues found that a PAI curriculum for first year medical students significantly increased knowledge and positive attitude (self-confidence, necessity, utility) scores from pretest to posttest (Bass et al., 2004). No studies; however, have examined changes in resident PAI behaviors following a medical education intervention, therefore no hypothesis was proposed. The secondary qualitative data was used to explain and/or illustrate the quantitative findings. For the secondary purpose to evaluate participants' perceptions of the instructional strategies, only qualitative methods were employed.

Background

The training program was titled Physical Activity Interventions in Pediatric Primary Care (PAIPPC). The PAIPPC training was sponsored by the Duke University Hospital Healthy Lifestyles for Children program. The Healthy Lifestyles for Children (HLC) program is a referral-based, outpatient pediatric obesity treatment program which includes physical assessment, nutrition counseling, physical activity counseling, and participation in physical activity sessions. Additionally, HLC posts educational materials in the clinic rooms to educate patients on the recommendations for nutrition, physical activity, and screen behaviors. These materials include room posters, a “healthy habits” questionnaire, and a handout related to their “5-3-2-1-Almost None!” campaign. The PAIPPC program referenced these materials, but also emphasized additional information and skills to aid practitioners in providing PAI for pediatric patients and their parents.

Participants

The PAIPPC training program was attended by pediatric residents at Duke Children’s Hospital who were participating in a rotation called Community Pediatrics and Advocacy (CPA). During this rotation, multiple topics were covered (e.g., nutrition counseling, breastfeeding advocacy) from August through June of 2011-2012. The residents rotated to a different topic each month in small groups of 1-2 participants; therefore, each month the PAIPPC program had a new small group of attendees. All pediatric residents in the CPA rotation (N = 17) were required to take the PAIPPC training program. Outcome data was only reported for residents’ who completed informed consent and completed the evaluation measures at pretest and posttest (n = 13).

Program Development

The development phase of the PAIPPC program proceeded with 5 steps:

1. Identify domain content from the literature.
2. Translate domain content into competencies (i.e., learning objectives).
3. Design instructional materials.
4. Determine evaluation tools.
5. Define evaluation methods.

Domain Content

Domain is defined as “sphere of knowledge, influence, or activity” (Merriam-Webster); therefore, the domain content for this study is the critical knowledge and skills pediatricians need to deliver effective PAI in primary care. Based on a review of PAI and pediatric behavioral counseling literature, the following concepts were gleaned to produce the domain content for the PAIPPC program:

- The health benefits of PA for youth, especially in reducing risk factors for adult chronic diseases, improving mental health and cognitive function, and enhancing motor development
- The mechanisms for the relationship between PA and the health benefits
- The low prevalence of youth meeting PA guidelines
- The correlates of, or factors associated with youth PA participation

- The low prevalence of health care practitioners employing physical activity interventions
- Efficacy of primary care-based physical activity interventions
- Strategies and tools used to screen for PA level
- Strategies and tools used to give PA advice or prescription
- Strategies used to provide personal counseling to increase motivation and accountability for PA (e.g., goal-setting, social support, community resource referral)
- Theories and models (TTM, SCT, MI, 5As) used to frame PA interventions
- anticipatory guidance to provide framework for behavioral health counseling (e.g., PA counseling)

Competencies

The competencies were drawn from the physical activity domain content and were organized around the 2 major themes.

Theme 1-Rationale for implementing PAI in pediatric primary care.

1. Competency 1-Understand the mechanisms for the relationship between physical activity and various physical and mental health benefits.
2. Competency 2-Describe developmentally appropriate NASPE and HHS guidelines for youth PA.

3. Competency 3-Describe the rationale for providing PA promotion in pediatric primary care to enhance motor development, mental health and reduce risk for obesity and chronic disease risk factors.
4. Competency 4-Understand the correlates of youth PA behavior, especially those that can be addressed through PA interventions in the primary care setting.

Theme 2- Guidelines and strategies for implementing PAI in pediatric primary care.

5. Competency 5-Describe how Bright Futures health supervision guidelines create a framework to integrate PA counseling into the anticipatory guidance portion of health supervision visits.
6. Competency 6-Use guides and tools to screen patients for PA level and provide PA prescription.
7. Competency 7-Acquire skills to provide PA counseling.
8. Competency 8-Identify community resources for PA referral (e.g., schools, parks and rec) and ways to partner with community organizations to promote PA.

Instructional Materials

The instructional materials for the PAIPPC training program included a curriculum and an instructor manual. These instructional materials reflected a competency-based educational framework as recommended by the Accreditation Council for Graduate Medical Education ([ACGME] Taylor & Swing, 2010). Taylor and Swing (2010) described the following characteristics of competency-based medical education: (a)

explicit and aligned with expected competencies; (b) criteria-driven, (c) focused on accountability to benchmarks, guidelines, and clinical evidence; (d) grounded in “real-life” experiences; (e) fosters the learners’ ability to self-assess performance against standards; and (f) individualized, providing more opportunities for independent study. Taylor and Swing suggest a few educational methods that are aligned with these characteristics, including: (a) evidence-based learning, (b) guided learning, (c) practice-based learning, (d) case-based learning, and (5) role-playing; all of which are included in this curriculum.

Evidence-based learning is the process of framing testable research questions, searching for best evidence, and critically evaluating the evidence (Taylor & Swing, 2010). The PAIPPC training fostered evidence-based learning by providing a review of the PAI evidence which was discussed during the didactic session. Guided learning uses prompts such as questions, cues, and published guidelines to direct the attention of learners (Taylor & Swing, 2010). In this study, participants were prompted with several guided learning questions which were embedded in the PAI evidence review and discussed in the didactic session. These questions were intended to focus the participants’ reading and get them to reflect on how the material could be applied to their experiences in the clinic. Practice-based learning involves the learner appraising their current medical practices, examining the scientific evidence, and assimilating evidence-based practices to improve patient care (Taylor & Swing, 2010). During the PAIPPC, practice-based discussion prompts were used to encourage residents to consider how the domain content might apply patient experiences they had in Continuity Clinic, thus

focusing on “real-life” applications. For example, residents were asked to consider whether or how their practice screens for PA and whether or where PA counseling would “fit” into the typical flow of a primary care well-visit. In case-based learning, the learners are presented with a specific patient scenario and tasked with defining and resolving the problem. The learners typically review relevant domain content in advance to be able to address the issues in the case, and also receive some guidance and focus from the instructor to work toward and select from appropriate resolutions (Srinivasan, Wilkes, Stevenson, Nguyen & Slavin, 2007). In the PAIPPC training, four cases (one from each age division) were considered following a brief review of the domain content. Through guiding questions from the instructor, residents were tasked to identify indicators of sedentary lifestyle and then make recommendations for appropriate PA prescription and counseling strategies.

Role-playing is where one participant plays the role of physician and another participant or the instructor plays the role of patient, thus providing participants the opportunity to experience different roles (Kern et al., 2009). In the PAIPPC program, participants were asked to write a case that reflected a recent patient who needed PA counseling. Then, the participant acted as that patient while another participant practiced providing PA counseling for them.

Additionally, the PAIPPC curriculum included several of the educational methods recommended by Kern and colleagues (2009), including: (a) readings, (b) lecture, (c) discussion, (d) demonstration, and (f) performance feedback.

Curriculum. The curriculum (Appendix A) had 2 sections, one for each didactic session. Session 1 examined the background and rationale for providing PAI in pediatric primary care. Session 2 considered how to implement PAI in pediatric primary care. For session 1 and 2, the curriculum included: (a) a reading with guided learning questions (to be reviewed after the pretest but prior to the first session), (b) practice-based discussion prompts, and (c) cases with guided learning questions. Session 2 also included a case-based role playing activity where each resident practiced PA promotion while another resident or the instructor served as the patient.

Instructor manual. The instructor manual (Appendix B) was designed to ensure consistent delivery of the PAIPPC curriculum for each month of residents. The manual followed recommendations from the Instructional Design and Materials Guide, a tool for designing medical education programs. The instructor manual included the following sections: (a) schedule, (b) materials needed, (c) and the educational strategies that were to be used (i.e., lecture, guided learning questions, practice-based discussion prompts, cases, and role-play scenarios).

Evaluation Tools

This section will describe the quantitative and qualitative evaluation tools used in this study; and the processes used to refine these tools through expert evaluation and pilot testing.

KAB assessment. The KAB assessment (Appendix C) was designed by the primary investigator and included 4 sections to identify participants PAI background and measure their PAI knowledge, attitudes, and behaviors, respectively. The background

section assessed characteristics which may influence participants' PAI knowledge, attitudes, and behaviors; including gender, previous training in PAI, familiarity with the 5-3-2-1-Almost None! campaign, and personal PA behaviors.

The knowledge section reflected the domain content and competencies. This section utilized a case-based question structure which was modeled after the knowledge response questions developed by Bass and colleagues in their evaluation of a medical school course on nutrition and physical activity counseling (Bass, Stetson, Rising, Wesley, et al., 2004). Additionally, the case-based knowledge questions were designed to reflect characteristics of competency-based education in that they were (a) grounded in real-life experiences, (b) aligned with the course competencies, and (c) focused on guidelines and clinical evidence (Taylor & Swing, 2010). All of the questions refer to a specific patient case; therefore, they assess real-life application of PAI knowledge. Table 7 shows the specific competencies targeted in each knowledge test item.

Each competency was represented by at least one knowledge test questions; however, competencies with more content (i.e., competencies 1 and 7) or with overlapping concepts (i.e., competencies 2 and 6) were represented by multiple questions. Knowledge test scores were based on the number of correct items out of 10. The attitudes and behaviors questions were adapted from studies that assessed factors related to physician PAI habits (Walsh et al., 1999) or assessed physicians' perceptions of the necessity and feasibility of health care-based physical activity promotion (Albright, Cohen, Gibbons, Miller, et al., 2000; Pinto, Goldstein, DePue, Milan, 1998). None of these sources cited psychometric properties for the questions.

Table 7.

Knowledge Questions Used to Assess Competencies

Competencies	Question # - Content
Competency 1-Understand the mechanisms for the relationship between physical activity and various physical and mental health benefits.	<p>Question 1-Identify correct health benefits of PA for youth</p> <p>Question 2-Identify correct mechanisms for relationship between PA and CVD</p>
Competency 2-Describe developmentally appropriate NASPE and HHS guidelines for youth PA.	Question 4-Identify correct types of PA that address aerobic, muscle strengthening, and bone strengthening guidelines
Competency 3-Describe the rationale for providing PA promotion in pediatric primary care to enhance motor development, mental health and reduce risk for obesity and chronic disease risk factors.	Question 3-Identify valid rationalizations for youth PAI in primary care
Competency 4-Understand the correlates of youth PA behavior, especially those that can be addressed through PA interventions in the primary care setting.	Question 5-Identify evidence-based correlates of youth PA that can be addressed in primary care.
Competency 5-Describe how Bright Futures health supervision guidelines create a framework to integrate PA counseling into the anticipatory guidance portion of health supervision visits.	Question 6-Identify correct pediatric primary care PAI schedule based on Bright Futures guidelines
Competency 6-Use guides and tools to screen patients for PA level and provide PA prescription.	Question 7-Identify correct youth PA guidelines using FITT prescription

Table 7. (continued)

Competencies	Question # - Content
Competency 7-Acquire skills to provide PA counseling.	Question 8-Identify correct MI counseling techniques
	Question 9-Identify appropriate MI question for developing discrepancy
Competency 8-Identify community resources for PA referral and ways to partner with community organizations to promote PA.	Question 10- Identify correct examples of community resource support

The attitudes constructs for current study were (a) how necessary do you think it is to provide (PAI strategy), (b) how feasible do you think it is to provide (PAI strategy), (c) how knowledgeable are you on how to provide (PAI strategy), and (d) how confident are you that you can change a patient’s physical activity behavior by providing (PAI strategy). For each construct there were 4 questions to assess their attitude about each of the four PAI strategies outlined in the curriculum: (a) physical activity screening, (b) prescription, (c) counseling, and (d) community resource support. The “confident” questions; however, were additive, such as: how confident are you that you can change a patient’s physical activity by providing physical activity screening, how confident are you that you can change a patient’s physical activity behavior by providing physical activity screening and counseling, etc. The attitudes questions contained a 4-point Likert scale with tags such as the following: 1-not necessary, 2-somewhat necessary, 3-necessary, 4-very necessary.

The behaviors questions identified the number of total well-child patients seen in the previous 2 weeks and the number of well-child patients who were provided with PA screening, PA prescription, PA counseling, and PA community resource support. The KAB assessment questions were evaluated by experts and pilot tested with a sample of medical students (described in the next section) prior to program implementation.

Participant Feedback form. After the last session the residents were asked to provide feedback about the training program using the Participant Feedback form (Appendix C). This form was designed by the primary investigator to evaluate residents' post-program reactions to the PAIPPC curriculum in terms of its quality, accuracy, organization, and usefulness. This form contained 7 items that utilized a 4 point Likert scale with the following tags: 1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). Additionally, these items had a space for comments. The form also contained 3 open-ended questions to garner feedback on the most and least useful parts of the curriculum and suggestions for curriculum improvement. This feedback will be used to further refine the training program for future rotations.

Instructor field notes. Taking field notes is a common qualitative research method in which an investigator observes participant interactions in a real world setting and takes objective notes about the experience. Field notes can be documented discreetly in short hand during the observation and/or written as a detailed narrative as soon as possible after the observation (Mack, Woodson, MacQueen, Guest, & Namey, 2005). Mack and colleagues (2005) advises observers to take notes on the following aspects of the interaction: (a) how people behaved and reacted, (b) what was said in conversation,

(c) where people were positioned in relationship to one another, (d) their comings and goings, (e) physical gestures, and (f) observer's subjective responses to what was observed (p. 21).

For the PAIPPC program, the instructor/researcher typed detailed narrative field notes into a laptop immediately (i.e., within 15 minutes) following the sessions. While the observer was careful to make objective observations, the nature of the observations was strongly informed by the research purposes. Specifically, in addition to making observations based on the criteria above, the observer was primed to take note of the following: (a) participants' previous experience with PAI training, (b) applied knowledge of PAI to cases and discussion, (c) attitudes about PAI, (d) skills in conducting PA counseling, and (e) reactions to the instructional strategies.

Participant focus group. All participants were invited to participate in a focus group held at the conclusion of the program. The focus group questions (Appendix D) flowed from the research purposes. A research assistant served as the focus group moderator and was trained to deliver probes following the planned questions to foster interaction and equal participation among all participants (Nichols, n.d.).

Expert evaluation. The Instructional Design Evaluation Form (IDEF) was used to evaluate and refine the PAIPPC curriculum and evaluation instruments during the development phase. The IDEF (Appendix E) is based on the Instructional Design Evaluation Guide which provides a framework for course development in medical education (International Training & Education center on HIV, n.d.). The IDEF is organized into 3 sections to evaluate an educational program in terms of its (a) domain

content, (b) instructional design, and (c) assessment methods. The items in each section have contain a 5 point Likert scale (1 = poor, 3 = satisfactory, 5 = excellent. Evaluation of the domain content considered the accuracy, evidence-base, and sequencing of the information. This evaluation established the content validity of the PAIPPC program, or the extent to which the program accurately reflects the constructs laid out in the domain content (Trochim, 2006). The instructional design evaluation (curriculum and instructor manual) examined elements such as agenda, learning objectives, teaching methods, and active learning exercises. Evaluation of the assessment methods (KAB assessment and the Participant Feedback form) considered whether the items measured reaction (i.e. participant feedback), learning (i.e., knowledge and skills), and behaviors (i.e., implementing new knowledge and skills). Evaluation of the assessment methods also examined the wording, question structure, and instructions of the items/instruments.

Given the interdisciplinary nature of the PAIPPC program and the IDEF form, multiple experts evaluated the instructional and assessment materials. Experts were selected based on their disciplinary training and research interests to address the following areas of expertise: (a) physical activity and health, (b) medical education, and (c) behavioral counseling interventions in pediatric medicine. Table 8 lists the expert evaluators and a summary of their discipline and research and professional experience to demonstrate their qualifications to serve as an expert evaluator for this training program.

Table 8.

Professional Background for Expert Evaluators

Expert Institution	Discipline/ Subdiscipline/ Specialty	Research Interests and Professional Experience
Dr. Debra Best Duke University	Medicine/ Pediatrics/ Medical Education	Dr. Best’s research interests are medical education and community engagement. She received her MD from Northwestern University Feinberg School of Medicine and completed her residency at Duke University Medical Center. Dr. Best is an Assistant Professor of Pediatrics and the Course Director for the Community and Pediatrics Advocacy rotation for second year pediatric residents.
Dr. Paul Davis UNC Greensboro	Kinesiology/ Exercise Physiology/ Physical activity and health	Dr. Davis’ research centers on the effects of PA on obesity, CVD, and diabetes risk factors. He received his Ph.D. and M.S. degrees in Exercise Science from the University of South Carolina. Before completing his doctoral degree, he also worked several years in cardiac rehabilitation. Dr. Davis is a member of the American Heart Association and a Fellow of the American College of Sports Medicine (ACSM). His service to ACSM includes membership on the Executive Board of the Southeast Chapter.
Dr. Sarah Armstrong Duke University	Medicine/ Pediatrics/ Obesity management and behavioral counseling interventions	Dr. Armstrong's clinical and research interests are in the prevention and treatment of childhood and adolescent obesity, particularly for the primary care outpatient setting. She received her MD from the University of Virginia Medical School and completed her residency at Children’s Hospital of Philadelphia. She is board certified in Pediatrics. As director of the Duke Children's Healthy Lifestyles Program, Dr. Armstrong oversees a cohort of over 3000 overweight youth.

The experts were contacted during program development, and upon agreeing to provide evaluation, were sent the following instructional and assessment materials: (a)

curriculum, (b) instructor manual, (c) Knowledge, Attitudes, and Behaviors (KAB) assessment, and (d) Participant Feedback form. Using a modified version of the IDEF, experts were asked to rate various elements of the program. The maximum score was 120, and the received scores were 108, 111, and 118. Furthermore, all of the items (except one item that received a 3 from one expert) received scores of 4 or 5. This expert panel served to confirm the content validity of the curriculum and assessment instruments, or whether the curriculum and assessment are a good translation of the domain content and the associated stated competencies (Trochim, 2006).

Pilot testing. The KAB Assessment was pilot tested among a convenience sample of medical students (n = 10). These participants were recruited via e-mail from a list of medical students attending a university recreation center. The e-mail contained a recruitment letter (Appendix F), a link to the online informed consent form (Appendix G), and a link to the online KAB pilot assessment (Appendix C). The recruitment letter provided study instructions and informed participants that they would receive coupon for personal training services at the university recreation centers as compensation for participating in the pilot study. The pilot version of the KAB Assessment assessed whether the instructions and the meaning and wording of the questions were clear.

The expert evaluation and pilot testing were used to refine the instructional materials and instruments prior to formal implementation of the PAIPPC training program for residents in the Community Pediatrics and Advocacy rotation.

Based on the expert evaluation and pilot testing, the following refinements were instituted:

- Instructional materials and activities
 - Combined multiple assigned journal articles into 2 narrative reviews, one for each of the didactic sessions.
 - Reorganized the initial 6 multi-concept competencies to 8 single-concept competencies.
 - Added case-based learning activities with guided questions
 - Added a brief video depicting a Motivational Interviewing scenario
- KAB Assessment
 - Reworded some KAB questions for clarity.
 - Changed the content of 3 KAB questions to better reflect competencies.

Evaluation Method

An embedded mixed methods approach was used to integrate the data sources during data analysis. In this approach, quantitative and qualitative data analysis methods are mixed, such that a secondary analysis is conducted concurrently or sequentially with the primary analysis and is considered within a primary analysis to help explain those findings (Creswell & Plano Clark, 2011). For this study, the primary analysis was the quantitative strand which included the following evaluation tools: (a) Participant Feedback form quantitative questions, and (b) pre- and post-test KAB Assessment. The secondary analysis was the qualitative strand which included the following evaluation

tools (a) participant feedback form qualitative questions, (b) instructor field notes, and (c) a participant focus group. In deciding whether and how to use a mixed methods approach, Creswell and Plano Clark recommend that researchers consider the following concepts: (a) describe reason for selecting a mixed methods design, (b) clarify fixed or emergent methods, (c) select mixed methods design typology, (d) explain logistics of mixing quantitative and qualitative strands.

Reason for mixed methods design. A mixed methods approach may be merited when one type of data is insufficient to address the research question or one type of data can help explain or illustrate the other. In this study, the primary quantitative data analysis was insufficient due to both lack of adequate sample size and lack of statistical sensitivity to pre to posttest changes in KAB, possibly due to ceiling effects with fairly high KAB at baseline. The secondary qualitative data also provided more texture and voice to the quantitative data. Greene, Caracelli, and Graham (1989) defined this relationship as “complementarity,” where the secondary data seeks elaboration, enhancement, illustration, and clarification of the primary data set. In this study, the qualitative data provided vivid examples and quotes that illustrated the findings from the quantitative methods. Another reason for mixed methods is “explanation”, where one data source is used to help explain the findings of the other (Creswell & Plano Clark, 2011). In this study, the secondary qualitative methods were implemented to gain insight to the possible processes behind changes in the primary quantitative KAB. Additionally, it was felt that the secondary purpose to identify the most effective instructional strategies would be better addressed with qualitative such that focus group participants’ would be

given the space to explain their reactions to the intervention (Creswell & Plano Clark, 2011).

Fixed or emergent methods. With fixed mixed methods, the use of quantitative and qualitative methods is pre-determined and planned at the start of the study. With emergent mixed methods, the decision to use mixed methods arises once research has already commenced. In this study, the decision to use mixed methods was fixed; however, the nature of the secondary qualitative analysis emerged during the early months of data collection. Before the study was initiated, the pre-planned mixed methods included the quantitative KAB assessment and Participant Feedback form and qualitative field notes and participant interviews. Early on during data collection it became apparent that there was not enough time during session 2 or before the rotation ended to conduct the post-session interviews individually. Additionally, the interview script was very redundant with the quantitative participant feedback form they received the same day. The study design was therefore modified to instead include a focus group interview at the end of the program.

Mixed method typologies. There are several mixed method typologies that vary on logistical decision points such as priority, timing (concurrent or sequential), and integration strategy. These typologies include (a) convergent parallel design, (b) explanatory sequential design, (c) exploratory sequential design, (d) embedded design, (e) transformative design, and (f) multiphase design. In this study, an embedded mixed methods design was employed whereby a secondary qualitative strand was embedded in

the primary quantitative method. The embedded design was chosen as the best method to amplify and add depth the quantitative data.

Logistics of embedded mixed methods. Before implementing an embedded mixed methods design, 3 key logistical decisions must be made: (a) relative priority of strands, (b) timing of strands, and (c) point of integration for mixing strands. In this study the quantitative strand is primary and the qualitative strand is secondary. The timing of the strands was sequential and concurrent depending on the data source. The quantitative KAB and PF data and the qualitative field notes were collected concurrently; while the qualitative focus group was conducted sequentially after the quantitative data collection was completed. The point of integration, or the point where the strands are mixed, can occur at design, data collection, data analysis, or interpretation. In this study the focus group questions were derived from the research questions and were not influenced by the quantitative data which at the time of the focus group had been collected but not analyzed. Therefore, the point of integration between the quantitative data (KAB and PF) and the qualitative data (field notes and focus group) was at data analysis. In this type of integration, the quantitative and qualitative data collection was conducted independently, but then the results of the quantitative data analysis were used to generate themes for the qualitative data analysis. Once these themes were identified and defined, they were used to conduct a directed content analysis which is described further in the data analysis section.

Program Implementation

The PAIPPC program was implemented within the pediatric residency program at a renowned teaching hospital in the southeastern United States. Formal implementation of the PAIPPC training program involved the following procedures (Figure 2): (a) recruitment and obtaining informed consent, (b) pretest data collection, (c) delivering the PAIPPC curriculum, (d) posttest data collection, and (e) conducting a participant focus group.

Recruitment and Informed Consent

The study was approved by the UNCG Office of Research Compliance and the Duke University Institutional Review Board (IRB [Appendix I]). Additionally, the study was authorized by the CPA Rotation Coordinator for the Duke University Hospital Office of Graduate Medical Education (Appendix H).

Prior to the start of each monthly PAIPPC program, the instructor/researcher e-mailed a recruitment letter (Appendix F) to the pediatric residents scheduled to complete the Community Pediatrics/Advocacy rotation that month. The recruitment letter included program and study information and a link to the online informed consent form (Appendix G) and pretest KAB Assessment (Appendix C). The recruitment letter clarified that the pretest was required for the program as a needs assessment; but that participants could voluntarily agree to allow their responses to be used for the study. It also explained that all responses would be returned to an independent research assistant to be de-identified before being sent to the instructor. Therefore, participants' responses were anonymous and their participation in the study was confidential. Finally, the recruitment letter

described that participation in the study would not affect their performance in the program or rotation. The informed consent form repeated the above information provided in the recruitment letter. It also explained that the study posed minimal risks and no direct benefit or compensation. The informed consent form emphasized that participants could withdraw at any time. Finally, it included an electronic authorization line where residents could provide consent by clicking the check box labeled either “yes” or “no”.

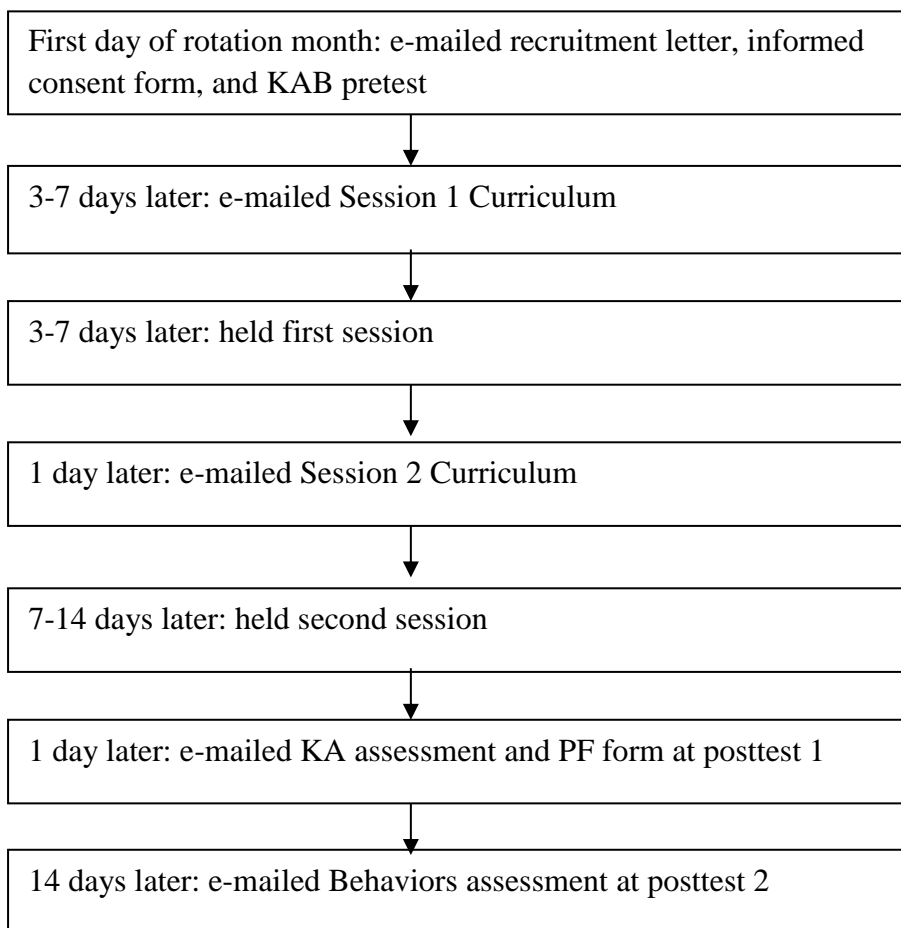


Figure 2. Data collection timeline.

These protocols assured that residents' participation in the study (or lack thereof) did not affect their performance in the program or rotation. Furthermore, these protocols reduced the likelihood of social desirability bias in responses. In other words, because residents knew their responses were anonymous, they may have been less likely to report false or exaggerated changes in PAI attitudes or behaviors following the course.

Pretest Data Collection

Whether participants selected “yes” or “no” on the informed consent form, they were then instructed to complete the online pretest KAB Assessment (Appendix C) that followed. Completion of the pretest was required for participation in the rotation and served as a needs assessment for the program. This pretest was the full KAB Assessment which included 31 items to assess PA promotion knowledge, attitudes, and behaviors. All submitted responses were electronically saved to an online database to which only the Research Assistant could access. The Research Assistant then downloaded the responses into a spreadsheet, de-identified each resident and assigned a participant number to their responses. Only the Research Assistant had access to the list linking the resident to their participant number. All Residents who completed the pretest KAB Assessment (n = 15) also provided consent to use their responses for the study. Therefore, the complete de-identified spreadsheet was shared with the Instructor/researcher.

Delivering the PAIPPC Curriculum

During the month long experience in PAIPPC, residents were scheduled to attend two 90-minute sessions. After the informed consent and pretest protocols were completed, the Session 1 Curriculum handout (Appendix A) was e-mailed to the

participants approximately 3-10 days prior to their first session. After the first session was held, the Session 2 Curriculum (Appendix A) was e-mailed to participants 3-10 days prior to the second session. The Session 1 Curriculum summarized the rationale for implementing PAI in pediatric primary care; while the Session 2 Curriculum presented guidelines and strategies for implementing PAI in pediatric primary care. The Session 1 and 2 Curricula included: (1) readings (i.e., evidence review) with guided learning questions (e-mailed after the pretest but prior to the first session), (2) practice-based discussion prompts, (3) and cases with guided learning questions. The Session 2 Curriculum also included a case-based role playing activity where each resident practiced PA counseling while another resident or the instructor served as the patient. Additionally, residents attended their normal Continuity Clinic shifts which consisted of one half day per week conducting well-child and sick-visits in the pediatric primary care clinic. Throughout the month, residents were encouraged to consider how the PAIPPC knowledge and skills could be applied to the patients they saw in clinic, and if possible, to practice using learned knowledge and skills with these patients.

During the PAIPPC sessions, the instructor kept detailed narrative field notes. The instructor typed these field notes into a laptop immediately (i.e., within 15 minutes) following the sessions. While the instructor was careful to make objective observations, the nature of the observations was strongly informed by the research purposes. Specifically, in addition to making general observations (e.g., participants were late, one participant knew the material more than the other, etc.), the observer was primed to take note of the following: (a) participants' previous experience with PAI training, (b)

participants' applied knowledge of PAI to cases and discussion, (c) participants' attitudes about PAI, (d) participants' skills in conducting PA counseling, and (e) participants' reactions to the instructional methods.

Posttest Data Collection

After the second session, the Instructor/researcher sent the residents an e-mail with instructions and a link to an online posttest KAB Assessment (Appendix C) and the Participant Feedback (PF) form (Appendix C). Completion of the posttest was required for participation in the rotation and served as an evaluation of residents' performance in the PAIPPC program. This posttest was the first 2 sections (i.e., knowledge and attitudes) of the KAB assessment and included 26 items to assess PAI knowledge and attitudes. The instructions explained that resident responses on the posttest KAB assessment and the PF would be downloaded and de-identified by an independent research assistant before being shared with the instructor; so their responses were anonymous. Two weeks after the end of training program, the Instructor sent residents an e-mail with instructions and a link to another online follow-up post-test. This follow-up post-test was the third section (i.e., behaviors) of the posttest KAB Assessment and included 5 items to assess PAI behaviors during the previous 2 weeks since the end of the PAIPPC training. All KAB Assessment questions were the same at pre and posttest, thus the difference in scores reflected changes in PAI knowledge, attitude, and behaviors following the training program. Figure 2 illustrates the data collection timeline that occurred each month of the PAIPC program. Table 9 summarizes the description and distribution for each section of the participant evaluation instruments.

Table 9.

Description and Distribution for Evaluation Measures

Assessment Instrument	Description	Distribution
KAB Assessment-Knowledge section	10-item multiple choice test reflecting competencies	Pre-test Posttest 1
KAB Assessment-Attitudes section	16-item questionnaire using a 4 point Likert scale to assess residents' attitudes about: (a) necessity of providing each PA promotion strategy (b) feasibility of providing each PA promotion strategy (c) confidence in their ability to change patient PA level using each PA promotion strategy (d) their knowledge of how to provide each PA promotion strategy	Pretest Posttest 1
KAB Assessment-Behaviors section	5-item questionnaire to assess the number of well-child patients seen in past 2 weeks and number of visits provided with the following PA promotion behaviors: (a) screening (b) prescription (c) counseling (d) community resource support	Pretest Posttest 2
Participant Feedback form	10-item questionnaire (multiple choice and short answer) to assess quality, clarity, and usefulness of program	Posttest 2

Participant Focus Group

At the end of the last month of the year-long PAIPPC program, all participants (N = 17) were invited to participate in a focus group to provide feedback about the program.

These participants were e-mailed a focus group recruitment letter (Appendix F) with a link to the focus group informed consent form (Appendix G). The consent form explained that a research assistant would be moderating and recording the focus group and that all identities and responses would be anonymous to the instructor and rotation administrators. Furthermore, participants were informed that they would receive a personal training gift certificate for attending the focus group. Four participants attended the focus group (n = 4).

The moderator, who was also the research assistant, was selected by the primary investigator for her excellent communication and rapport building skills. The moderator received training on focus group moderation by viewing an online power point presentation titled *Focus Group Training* (Nichols, n.d.). This presentation was particularly helpful in providing tips on following planned questions with probes to make the discussion more interactive and allow all participants to contribute equally. The focus group questions were generated by the primary investigator early in the PAIPPC program. One week before the focus group, the primary investigator met with the moderator to reiterate the purpose of the PAIPPC study, to review the focus group questions, and discuss the focus group training power point. The focus group lasted one hour and was audiotaped using 2 separate devices. A note taker was not used.

Data Analysis

An embedded mixed methods approach was used to integrate the data sources during data analysis. In this approach, quantitative and qualitative data analysis methods are mixed, such that a secondary analysis is conducted concurrently or sequentially with

the primary analysis and is considered within a primary analysis to help explain those findings (Creswell & Plano Clark, 2011).

Quantitative Strand

For this study, the primary analysis was the quantitative strand which included the following evaluation tools (a) pretest and posttest KAB Assessment and (b) the Participant Feedback form quantitative questions.

KAB Assessment. The KAB Assessment included 4 sections: (a) background, (b) knowledge, (c) attitudes, and (d) behaviors. The background section measured participants' experience with PA and training in primary care-based PAI. Descriptive statistics were calculated for these items. The knowledge section measured the residents' PAI knowledge before the program and within one week after the program. Descriptive statistics (mean, SD) were calculated and a paired t-test was used to compare pretest and posttest knowledge scores. A nonparametric Wilcoxon Signed Ranks test was also conducted to determine whether not assuming normality due to the small sample size would change the results (StatSoft, n.d.). The attitudes section measured 4 PAI attitudes constructs using a 4 point Likert scale (1 = not necessary, 2 = somewhat necessary, 3 = necessary, 4 = very necessary). The 4 attitudes constructs were (1) necessity of PAI, (2) feasibility of PAI, (3) confidence that PAI will change patient behaviors, and (4) perceived knowledge of PAI. This section was administered before the program and within one week after the program. Descriptive statistics (mean, SD) and effect sizes (Cohen's d [Cohen, 1992]) were calculated comparing attitudes for each PAI strategy at pretest and posttest. A multivariate analysis of variance (MANOVA) was conducted to

compare pretest and posttest ratings for combined attitudes. Univariate analyses were also run to examine pairwise comparisons for each attitudes construct. Correlations between dependent variables were examined to ensure that the dependent variables were not redundant. One clinically meaningful goal for the program was to increase mean ratings to at least 3 for each attitudinal construct.

The behaviors questionnaire measured residents' PAI behaviors before the program and during the 2 weeks following the program. Descriptive statistics (mean, SD) were calculated and a paired t-test was used to compare pre and post-program responses for each PAI strategy. Additionally, a nonparametric Wilcoxon Signed Ranks test was also conducted for each comparison to determine whether not assuming normality due to the small sample size would change the results (StatSoft, n.d.).

Participant Feedback form. Descriptive statistics were calculated for each item on the Participant Feedback (PF) form. Additionally, for the open-ended questions, directed themes were identified and reported based on the qualitative coding scheme outlined in the next section.

Qualitative Strand

The secondary analysis was the qualitative strand which included the following evaluation tools (a) PF form qualitative questions, (b) instructor field notes, and (c) a participant focus group. An embedded mixed method approach was used to integrate quantitative and qualitative data at the level of data analysis using directed content analysis. In directed content analysis, theory and/or prior research is used to identify initial coding categories and then operational definitions are determined for each

category. The goal of directed content analysis is to validate or extend conceptually a theoretical framework (Hsieh & Shannon, 2005).

Development of qualitative coding scheme. In this study, prior theory and the study purposes were used to generate broad constructs to be examined; and the results of the quantitative analysis were used to derive themes for the directed content analysis (Table 10). Then, the qualitative data was examined and coded to specifically identify content that explained (i.e., the why) or illustrated (i.e., the how) these themes.

All written (PF form and field notes) and audiotaped (focus group) data was reviewed at least 4 times after the themes were defined. During the first review of the written data the researcher simply read the content to determine if the themes were evident. On the second and third review the researcher made color-coded notations next to any content that reflected one of the themes. On the fourth review the researcher extracted notated passages and wrote them under the relevant theme on the coding form. During the first review of the audiotaped data, the researcher listened without doing any active coding to get familiar with the content. On the second and third review of the audiotaped data the researcher wrote time stamps and key words under the relevant theme on the coding form. During the fourth review the researcher extracted exact passages and wrote them under the relevant theme on the coding form.

Instructional Strategies

Only qualitative data was used to examine the secondary purpose of determining participants' perceptions of the instructional strategies. Open-ended questions regarding the effectiveness of various instructional strategies were included on the PF form and in

the focus group. A directed content analysis was again used, such that the constructs and themes were derived from the specific research question (Table 10). The same coding protocols and coding form were used to examine the written and audio data related to instructional strategies.

Table 10.

Constructs and Themes Used for Directed Content Analysis

Constructs	Themes
Knowledge	(a) Actual knowledge increased significantly.
Attitudes	(a) Perceived knowledge increase significantly across all PAI strategies; however, it remained modest (2-3) at posttest. (b) Necessity of PA screening, prescription, counseling, and community resource support was high. (c) Feasibility of PA screening and prescription was high. (d) Feasibility of PA counseling and community resource support was modest. (e) Confidence that PA promotion strategies would change behavior was modest.
Behaviors	(a) PA screening, prescription, and counseling behaviors were high. (b) PA community resource support behavior was low.
Instructional Strategies	(a) Instructional strategies that were most or least effective (b) Instructional strategies to improve the program

CHAPTER IV

RESULTS

The primary purpose of this study was to develop, implement, and evaluate a PAI training program for pediatric residents; particularly focusing on pretest to posttest changes in residents' knowledge, attitudes, and behaviors (KAB). The secondary purpose was to determine residents' perceptions of the instructional strategies.

In this chapter, participants' characteristics and response rates for all phases of the study are presented first, followed by results of quantitative and qualitative analyses of KAB data, quantitative and qualitative participant feedback data; and qualitative data on instructional strategies. An embedded mixed method approach was used to integrate quantitative and qualitative data at the level of data analysis, as described previously. Therefore, the quantitative and qualitative results are reported together such that for each KAB construct, the quantitative data are followed by qualitative data that explain or illustrate the quantitative results.

Participant Characteristics and Response Rates

The participants were 17 pediatric residents in the community rotation. Of those 17, 15 participants completed all sections of the KAB assessment at pretest, 13 participants completed the knowledge and attitudes sections at posttest 1, and 7 participants completed the behaviors section at posttest 2, which was collected 2 weeks after posttest 1 and often after the end of the rotation. Each section was analyzed

separately. Participants who did not complete both the pretest and posttest for a section were excluded from that analysis. Therefore, $n = 13$ for the knowledge and attitudes pre-post comparisons and $n = 7$ for the behaviors pre-post comparison. Nine participants completed the anonymous Participant Feedback (PF) form at posttest 1. Figure 3 illustrates the number of respondents who completed each section at each testing time.

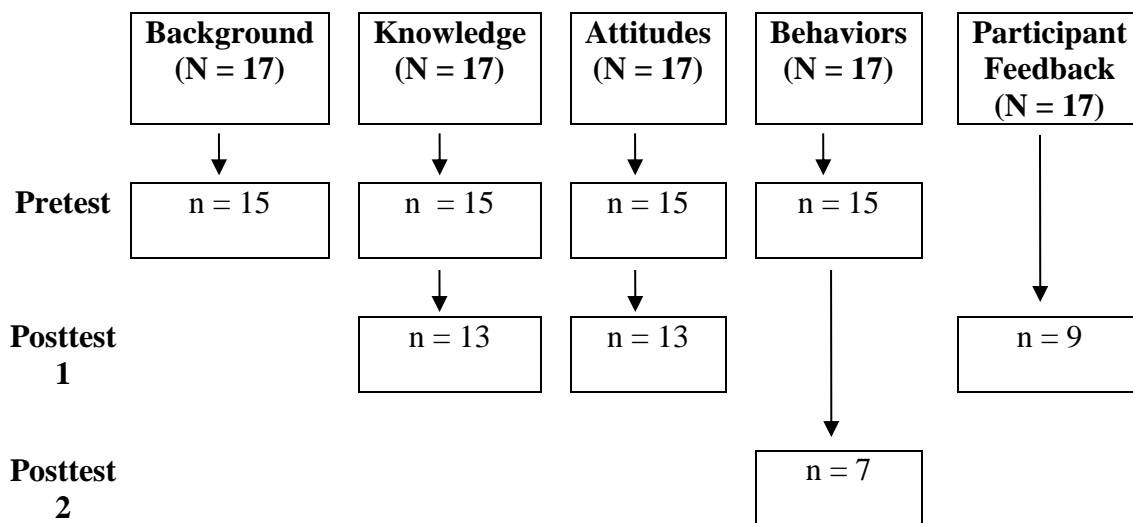


Figure 3. Response rates are shown for each KAB section at each testing time.

Of the participants who completed the knowledge and attitudes sections at pretest and posttest ($n = 13$), 54% (7 residents) had previous training in physical activity promotion in medical school or during their residency and 92% (12 residents) reported that they had seen and used materials from the “5-3-2-1-Almost None!” campaign during their clinic shifts. Additionally, 69% (9 residents) were currently meeting the adult physical activity guidelines. Table 11 summarizes the characteristics for the 13 participants.

Table 11.

Participant Characteristics

Characteristic	Frequency (%) (n = 13)
Female	9 (69%)
Male	4 (31%)
Had training in primary care-based physical activity promotion during graduate/medical school.	4 (31%)
Had training in primary care-based PA promotion during residency.	7 (54%)
Had seen materials from the 5-3-2-1-Almost None! campaign.	12 (92%)
Had used materials from the 5-3-2-1-Almost None! campaign.	12 (92%)
Met the adult PA guidelines of 5 days moderate or 3 days vigorous PA, or a combination.	9 (69%)

KAB Pre-Post Comparison

The 3 sections of the quantitative KAB assessment (knowledge, attitudes, and behaviors) were analyzed separately. Significant effects, meaningful effects, and effect sizes are reported. Cohen (1988) suggested that a small effect size was $d = .30$, a medium effect size was $d = .50$, and a large effect size was $d = .80$. Qualitative KAB data from the PF form, instructor field notes, and participant focus group was coded using directed content analysis based on themes derived from the quantitative findings. For each

construct, the qualitative results will be reported following the quantitative results to explain or illustrate the quantitative results.

Knowledge Pre-Post Comparison Results

Quantitative knowledge results. On the knowledge section of the KAB assessment, the mean pretest score was 4.15 (SD = 1.82) while the mean posttest score was 7.15 (SD = 1.77) out of 10 possible points (Table 12). A paired t test was conducted and Cohen's *d* was calculated, showing a significant increase from pretest to posttest, $t(12) = 6.43, p < .001, d = 1.78$, and a very large effect size.

The sample size for the knowledge comparison was small ($n = 13$). Therefore, a nonparametric Wilcoxon Signed Ranks test was also conducted for each comparison to determine whether not assuming normality due to the small sample size would change the results (StatSoft, n.d.). While the test statistic was different, the significant results were similar to those from the paired t test, therefore the Wilcoxon results are not reported.

The questions most commonly answered correctly at posttest were related to the PA guidelines for the recommended amount of PA and frequency of PAI; and PA counseling techniques. The questions most commonly answered incorrectly at posttest were related to the health benefits of PA and their mechanisms.

Qualitative knowledge results. In support of the quantitative findings, most participants commented on the PF form that the PA guidelines were the most useful information covered in the program. The instructor field notes illustrated the lower knowledge aptitude for PA benefits and mechanisms, saying "All residents so far are aware of the cardiometabolic benefits of PA, but only a few know of the other benefits

(motor development, mental health, self-esteem) and rarely can they enunciate the physiological mechanisms for any benefits.”

Table 12.

Frequency of Participants’ Correct Pre-Post Knowledge Responses

Question # and Content	Pretest Correct Frequency (%) (n = 13)	Posttest Correct Frequency (%) (n = 13)
1. Health benefits of PA for youth	6 (46%)	6 (46%)
2. Mechanisms for effect of PA on CVD risk	2 (15%)	5 (38%)
3. Rationale for youth primary care-based PAI	11 (85%)	11 (85%)
4. Types of PA that address aerobic, muscle strengthening, and bone strengthening guidelines	1 (8%)	6 (46%)
5. Evidence-based correlates of PA that can be addressed in primary care	7 (54%)	9 (69%)
6. Pediatric primary care PAI schedule based on Bright Futures guidelines	10 (77%)	13 (100%)
7. Youth PA guidelines using FITT prescription	3 (23%)	10 (77%)
8. General techniques for MI-based PA counseling	13 (100%)	12 (92%)
9. Developing discrepancy during MI-based PA counseling	3 (23%)	12 (92%)
10. Examples of community resource support	7 (54%)	9 (69%)

Attitudes Pre-Post Comparison Results

Quantitative attitudes results. On the attitudes section, the possible responses for each item were 1 to 4 (1 = not necessary, 2 = somewhat necessary, 3 = necessary, 4 = very necessary). One clinically meaningful goal for the program was to increase mean responses to at least 3 for each attitudes constructs. Descriptive statistics are reported for the PAI strategies at each attitudes construct (Table 13). A MANOVA was conducted on the 4 combined attitudes scores (necessity, feasibility, perceived knowledge, and confidence in changing patient behavior). Correlations between these dependent variables were examined to ensure that they were not redundant ($r > .7$ [Maxwell, 2001]). Eta-squared was calculated to determine the effect size. Cohen (1988) suggested that for eta squared (η^2), 0.0099 constitutes a small effect, 0.0588 a medium effect, and 0.1379 a large effect. There was a significant multivariate pretest to posttest increase in PAI attitudes and a very large effect size, $F(9) = 22.88$, $p < .001$, $\eta^2 = .91$. None of the correlations between dependent variables exceeded $r = .7$. Therefore, follow-up univariate analyses were conducted on each attitudes construct.

Perceived knowledge. Follow-up univariate comparisons revealed a significant pretest to posttest increase on perceived knowledge, $F(12) = 79.45$, $p < .001$, $\eta^2 = .87$, and a very large effect size for the comparison. Perceived knowledge scores were low at both pretest and posttest for all PA intervention strategies (Table 14). Only PA prescription reached a perceived knowledge score of 3 at posttest.

Necessity. The pretest to posttest univariate comparison for necessity of PAI was not statistically significant; however, there was a large effect size for the comparison (η^2

= .18). Necessity scores were high for all PAI strategies at both pretest and posttest, possibly leading to a ceiling effect (Table 14). Necessity posttest scores exceeded 3 for all PAI strategies.

Table 13.

Multivariate and Univariate Attitudes Pre-Post Comparison

Attitudes Constructs	Pretest M (SD)	Posttest M (SD)	Univariate F	<i>p</i>	η^2
Perceived knowledge	7.46 (1.26)	11.15 (1.340)	79.45	< .001*	.87
Necessity	13.31 (2.10)	13.85 (1.68)	2.63	.131	.18
Feasibility	10.54 (2.18)	11.92 (1.19)	4.60	.053	.28
Confidence in changing patient behavior	9.00 (2.38)	9.92 (2.25)	3.25	.097	.21
Multivariate F			22.88	<.001*	.91

*Shows significance $p < .05$

Feasibility. The pretest to posttest univariate comparison for feasibility approached significance and had a large effect size, $F(12) = 4.60$, $p = .053$, $\eta^2 = .28$. Only PA screening and prescription (Table 14) achieved a mean feasibility score of 3 at posttest.

Confidence in changing patient behavior. The pretest to posttest univariate comparison for confidence in changing patient behavior was not significant; however, there was a large effect size. Confidence scores were below 3 at both pretest and posttest for all PA intervention strategies (Table 15).

Table 14.

Pre-Post Comparison for PAI Strategies at Each Attitudes Construct

Attitudes Construct	PAI Strategy	Pretest M (SD)	Posttest M (SD)	<i>d</i>
Perceived Knowledge	Screening	2.00 (.41)	2.85 (.69)	1.55
	Prescription	1.77 (.60)	3.00 (.41)	2.13
	Counseling	2.00 (.58)	2.85 (.37)	1.78
	Community resource support	1.69 (.48)	2.46 (.52)	1.29
Necessity	Screening	3.77 (.44)	3.92 (.28)	.28
	Prescription	3.00 (.82)	3.38 (.65)	.79
	Counseling	3.62 (.51)	3.46 (.52)	.43
	Community resource support	2.92 (.86)	3.08 (.76)	.23
Feasibility	Screening	2.92 (.86)	3.46 (.52)	.49
	Prescription	2.62 (.51)	3.15 (.69)	.61
	Counseling	2.69 (.63)	2.77 (.44)	.17
	Community resource support	2.31 (.63)	2.54 (.52)	.32
Confidence in changing patient behavior (additive)	Screening	1.77 (.44)	2.15 (.69)	.44
	Screening + prescription	2.15 (.56)	2.38 (.65)	.32
	Screening + prescription + counseling	2.54 (.97)	2.69 (.63)	.24
	Screening + prescription + counseling + community resource support	2.54 (.97)	2.69 (.75)	.29

*Shows significance $p < .05$

Qualitative attitudes results. A directed content analysis of the qualitative attitudes data supported and extended the quantitative results.

Perceived knowledge. Qualitative data analysis illuminated the knowledge concepts that were considered most important by participants. These included PA benefits, PA guidelines (frequency, intensity, time, and type of PA), AAP/Bright Futures Anticipatory Guidance recommendations, and sample PA promotion tools, particularly screening forms and MI questions. On the PF form, most participants commented that the PA guidelines were the most useful information covered in the program. During the focus group, one participant commented on the physical activity benefits, saying, “The literature shows how important PA is for these kids.” Another participant said about the PAIPPC program, “It introduced me to the Bright Futures Pocket Guide, a helpful tool that I went 2 years without knowing it existed, so that’s good.”

Necessity. Qualitative data analysis provided several explanations for the high PAI necessity scores. First, understanding the PA guidelines as a prescription helped increase participants’ attitudes about the necessity of PAI. One participant in the focus group stated, “I always thought it [PAI] was important but now I actually make it important during my visit because I know how to talk about the specific guidelines.” Second, participants increased their attitudes toward the necessity of PAI for younger kids, saying, “I’ve changed my attitude about [PAI for] younger kids because before I didn’t really think about them.” Third, participants’ attitudes about the necessity of PAI increased due to the strength of the evidence. A participant commented on the PAI evidence, “a lot of us are trained that if there is evidence behind something, we try our best to incorporate it.”

Feasibility. Prior to the program, participants already had some PA screening and prescription prompts during a well-child visit; however, the program gave them specific information and skills to use at those prompts. During the focus group a participant said, “I get to that section [the physical activity prompt on the computer] that says activities and for me it at least jogs my memory to say, what are you doing?” Another resident said, “It’s given me a lot more tools to use so it [PAI] just becomes easier.” For PA counseling, however, participants cited several barriers. First, they cited lack of time and the complexity of patient medical issues. One focus group participant said,

I think it [PA counseling] is feasible, but we’re already hinting at some of the barriers. While we would love to say at every visit it could happen, there are visits where it seems that whether due to a fault of our own or just the complexity of the patient, and the lack of time, and the inefficiencies of the system we just don’t get it done.

Second, participants reported that they needed earlier and more frequent training to improve their PA counseling rather than waiting until their third and final year, particularly given that they were seeing patients in clinic throughout their residency years. One resident said,

It’s important somehow that we talk about this throughout our residency curriculum, and not at the end of our curriculum. I am literally leaving Durham and I have my community rotation last...and it was 36 months into residency, just at least speaks to the fact that things were missed in my skill set if I had not developed some of this stuff.

Another said, “It’s definitely changed my well-child visit, after being on [the] community [rotation]...all those poor patients, I ignored their physical activity. It would have been

nice to get it earlier.” Regarding the low feasibility for PA community resource support, participants cited lack of knowledge about specific PA community resources, saying; “I would like to know all of my community resources [for physical activity].” Field notes indicated that participants responded very favorably to the pending development of an “activity finder” website that could help providers quickly create a filtered list of community PA resources. Another field note commented that several participants supported the idea of embedding a health educator on the primary care team so that physicians could refer patients to these experts for more comprehensive PA counseling and community resource support.

Confidence in changing patient behavior. During the focus group, participants revealed several explanations for their low confidence that PAI would actually change patients’ PA behaviors. First, the majority of residents’ patients were low income and enrolled in the county Women, Infants, and Children (WIC) program, which provides special nutrition and health care support for low income families. These families commonly had social and medical complications that presented real barriers to physical activity, such as concerns about safety and obesity comorbidities. One participant said,

Sometimes I get so distracted when I see their past history and their social history and I just get so focused on that and I’m like why don’t you come back for a weight check and then they don’t come because it not that important to them.

Second, their patients complain of many perceived barriers, including weather, lack of time, and lack of access. A participant commented,

They can't seem to get past all the excuses, all the barriers, and so we can try to problem solve some of them but we can't fix all of them. That's what gets hard, so then we run out of ideas.

Third, participants feel that increasing PA and weight loss is only successful when the whole family gets involved, which is rare. While participants shared stories of families that were successful, they more commonly described patients whose parents didn't support them, or worse yet, were critical of the child. One participant described,

In clinic they say "I don't know why my kid is fat"...it doesn't work as well with those because it turns into a very negative situation with the kid; and I've seen some parents get super nasty and it's not helpful.

Fourth, participants feel that many patients are not motivated or ready to change their PA.

A resident explained,

Mom really wanted to do something about it [their child's low PA and obesity] and is really invested in it, but it seems like there is a never ending supply of excuses as to why it's still not working...what that speaks to is them not actually being ready to have the whole process...it's stages of change; they know there's a problem, they want to do something about it, they're just not there.

Fifth, participants cited that culture and the environment make it easy to be sedentary, describing,

The culture we live in, it's not an excuse, but it does make it more difficult [to be active]...with technology, phones, video games, ipads. It just speaks to how being sedentary is easy, and it's summer [vacation] so [kids think] I need to be doing what's easy and that's hard to break.

Finally, even when participants try to overcome time constraints by setting up follow-up visits to devote to address PA, nutrition, and weight; many patients don't show.

Behaviors Pre-Post Comparison Results

Quantitative behaviors results. The behaviors section of the KAB assessment measured the number of pediatric well child visits conducted in the past 2 weeks (2 weeks before the program and 2 weeks after the program) and the proportion of those visits in which PA screening, prescription, counseling, and community resource support were provided (Table 15). According to AAP/Bright Futures guidelines, PA screening and prescription should be provided for all well-child visits, while PA counseling and community resource support are only indicated if the patient does not meet PA guidelines based on screening. Descriptive statistics, paired t tests, and effect sizes (Cohen's *d*) are reported for each PAI strategy (Table 15).

Table 15.

Behaviors Pre-Post Comparison

PAI Behaviors	Pretest M (SD)	Posttest M (SD)	t	P	d
Screening	.82 (.24)	.98 (.05)	1.79	.123	.92
Prescription	.44 (.46)	.98 (.05)	3.22	.018*	1.96
Counseling	.55 (.37)	.73 (.32)	.98	.366	.35
Community resource support	.04 (.09)	.12 (.25)	.80	.452	.33

*Shows significance $p < .05$

The sample size for the behaviors comparison was small ($n = 7$) because the posttest behaviors data was requested after residents had completed the rotation. Therefore, a nonparametric Wilcoxon Signed Ranks test was also conducted for each comparison to determine whether not assuming normality due to the small sample size, would change the results. While the test statistic was different, the significant results were similar to those from the paired t test, therefore the Wilcoxon results are not reported.

Physical activity screening. The proportion of patients provided with PA screening was high at both pretest (mean = .82) and posttest (mean = .98), possibly causing a ceiling effect. The pretest to posttest difference was not statistically significant; however, there was a very large effect size for the comparison ($d = .92$). The proportion of patients provided with PA screening at posttest was clinically meaningful compared to the 56% screening rate reported in previous literature (Glasgow et al, 2001).

Physical activity prescription. For PA prescription, there was a significant increase, $t(6) = 3.22$, $p = .018$, $d = 1.96$, from pretest (mean = .44) to posttest (mean = .98) and a very large effect size for the comparison. This finding was also a clinically meaningful result compared to previous literature where the PA prescription rate was 28%.

Physical activity counseling. The proportion of patients provided with PA counseling was clinically meaningful at both pretest (mean = .55) and posttest (mean = .73) considering that PA counseling is only indicated for patients who do not meet PA guidelines, which is an estimated 31% of the pediatric population (Pate et al., 2002).

Furthermore, the posttest counseling rate of 73% was much higher than the 11% reported in previous literature. The pretest to posttest difference; however, was not significant. There was a medium effect size for the pretest to posttest comparison ($d = .35$).

Physical activity community resource support. Physical activity community resource support was low at both pretest (mean = .04) and posttest (mean = .12). There was a medium effect size for the pretest to posttest comparison ($d = .33$). Physical activity resource support rates were not previously reported in the literature, rather they were considered part of PA counseling.

Qualitative behaviors results. The directed content analysis revealed many “real life” scenarios in which participants increased their use of PAI strategies.

Physical activity screening. According to instructor field notes, clinic protocols required the nurse to give each school-aged child (and/or their caregiver) a “Healthy Habits” questionnaire to screen for PA and other health behaviors, and the resident to review this form. Focus group participants reported that following the program, they were more likely to request and review the form for younger kids (aged 2 to 5 years old) and they were more likely to use the form as a prompt to discuss with patients what kind of activities they did.

Physical activity prescription. In focus group comments, participants reported the importance of knowing the specific PA guidelines (frequency, intensity, time, and type of PA) and the evidence to support these guidelines. A participant explained,

Before the program I was like “are you getting an hour of physical activity a day?” and they say “well sorta, kinda” and I just checked it off, but now after this [program] I will actually go in and figure out what they’re doing.

Physical activity counseling. Field notes indicated that during role play, participants’ skills in MI-based PA counseling were diverse. Some participants showed high fidelity to all MI skills and others displayed only basic MI skills such as using open-ended questions. All focus group participants recounted recent patient visits during which they used at least some of the basic tenets of MI-based PA counseling. They used open-ended questions, asked patients/caregivers what PA they were interested in doing, and asked patients/caregivers to consider how they could overcome barriers. Participants commented that previously they would simply tell patients/caregivers to be more active, advise which activities to try, and suggest ways to overcome barriers. The following is a great example of MI-based PA counseling, with MI concepts in { }, as described by a focus group participant,

I did have a [visit] today in Healthy Lifestyles clinic...she was 12 years old. She was quite honest that she’s exceptionally sedentary, especially during the summer. She literally does not go outside because it’s too hot and there are too many bugs. So I just tried to push her to think about things she could do {identify interests}. She seemed to hint that she doesn’t like to do things in the morning because she likes to sleep. So you know you allow people to win certain battles, so I let her win that battle {rolling with resistance}. So I said, “think about other times; when do you have more energy {consider barriers}?” She said, “in the evening.” I said, “ok, what do you think you could do in the evening that might even be some exercise or activity {identify interests}.” “Well I don’t mind walking when it’s cooler in the evening.” “So how frequently do you think you could do that?” She said, “maybe 4 times a week.” “That sounds great {build self-efficacy}.” So I don’t know if she’s going to do it but she sorted of talked her way into it, so then I turned to the grandmother and I said, “can I give your grandmother permission to hold you accountable?” and she said, “yes” {social support}, now she might be

screaming at grandma tonight when grandma is doing it, but I was trying to make it more her idea and almost put her on the spot to say people are going to hold you accountable and you need to do what you say you're doing.

Physical activity community resource support. Field notes described that participants typically did not know any community PA resources and sometimes tried to conduct a web search for parks and playgrounds to give patients ideas of where they could be active. A focus group participant said, "I would like to know all of my community resources [for physical activity]."

Participant Evaluation

Participant Feedback Results

Nine ($n = 9$) of the possible 17 participants submitted a PF form at posttest 2 (Figure 2). The quantitative portion of this form included 7 questions, each with a rating scale of 1 to 4 (1 = strongly disagree, 2 = disagree, 3 = agree, 4 = strongly agree). The qualitative portion included a comments box following each quantitative item and 3 open-ended questions regarding the most useful and least useful parts of the training program and ways to improve the program.

Table 16 displays the mean scores for each item. The total mean rating for the form was 23.56 out of a maximum of 28. The highest item mean rating (3.78) came on item 1: "The physical activity intervention training covered knowledge and skills that are important for my pediatric practice." On this item, one participant commented, "It was information that we rarely talk about in residency but is very important."

Table 16.

Participant Feedback with Response Frequencies and Mean Scores

Item	1 = Strongly Disagree	2 = Disagree	3 = Agree	4 = Strongly Agree	Mean Score
1. The physical activity intervention training covered knowledge and skills that are important for my pediatric practice.	0	0	2	7	3.78
2. I feel that I improved my physical activity intervention knowledge and skills as a result of this training.	0	0	5	4	3.44
3. This training has prompted me to initiate or change my physical activity intervention behaviors in my pediatric practice.	0	0	7	2	3.22
4. This training was well-organized.	0	0	7	2	3.22
5. The instructional materials and activities reflected the current evidence-base in physical activity interventions.	0	0	7	2	3.22
6. The instructional materials and activities were effective in helping me to improve my physical activity interventions knowledge and skills.	0	0	6	3	3.33
7. The competencies were clearly stated and addressed through the instructional materials and activities.	0	0	6	3	3.33

Item 3 received the most comments, particularly related to participants increasing their use of PAI. On this item one participant commented, “It has reminded me to mention it to all patients - including those who are not overweight.” Another said, “I intend to start asking all patients about PA during HOCC [well-child] visits.” Responses to the open-ended questions on most and least useful instructional strategies and alternative instructional strategies will be addressed in the next section.

Instructional Strategies

Only qualitative data were used for the secondary purpose of evaluating participants’ perceptions of the instructional strategies. These data included PF form comments and open-ended questions, focus group responses, and instructor field notes. This section reviews the most and least useful instructional strategies, and suggestions for new or alternative instructional strategies to improve the program.

The participants and the instructor reported that the most useful instructional strategies of the program were: (a) the PA guidelines tables, (b) PA benefits tables, (c) AAP/Bright Futures Pocket Guide, (d) sample counseling questions, and (e) the integrated curriculum. The PA guidelines tables outlined the recommended frequency, intensity, duration, and types of PA for different pediatric age groups. These guidelines were more comprehensive than the 5-3-2-1-Almost none! campaign that simply recommend an hour of PA daily. On the PF form, most participants listed the PA guidelines as the most useful instructional strategy. During the focus group, a participant said, “We definitely needed the guidelines.”

The PA benefits table outlined all the physical and mental health conditions that could be prevented or treated with PA and their physiological mechanisms. Field notes showed that prior to the program, most residents only knew the relationship between PA and cardiometabolic conditions; and few understood the relationship between PA and important pediatric areas such as motor development, mental health, and self-concept. Further, most residents were not familiar with the mechanisms for the relationship between PA and all of these health conditions.

Field notes also revealed that most residents knew very little about anticipatory guidance and none had seen or used the AAP/Bright Futures Health Supervision pocket guide which summarizes the 5 key anticipatory guidance topics to be addressed at a given well-child visit. Multiple participants commented that learning about the pocket guide was an important resource; saying, “it [the PAIPPC program] introduced me to the Bright Futures Pocket Guide, a helpful tool that I went 2 years without knowing it existed, so that’s good;” and “Give everyone a Bright Futures pocket guide at the beginning [of residency]!” The PA counseling questions were derived from lists of AAP/Bright Futures anticipatory guidance questions and MI questions. A resident in the focus group said, “the MI list of questions...was helpful.” Another said, “I learned a lot from the example questions and talking about the pitfalls and sort of the techniques of MI.”

Finally, a few participants mentioned that the knowledge and skills in the PAIPPC curriculum integrated well with other concepts covered in the community rotation and throughout their residency. A resident said,

I think the whole rotation we have within [the] community [rotation] is really structured around trying to make us better MI clinicians; so in that sense it wasn't just this program, but the fact that this program was building on a skill set or tools we were using in the Healthy Lifestyles curriculum and that we were hearing in a lot of other patient cases. I think it just made us more competent because it was another area in which we used the same skill set.

The participants and instructor reported that the least useful instructional strategies of the program were: (a) the long readings, and (b) role-playing. On the PF form a few participants commented that the pre-session readings were very long. The field notes indicated that most residents did not know any of the information from the readings, suggesting they had not reviewed the readings. Therefore, the instructor spent some session time giving a lecture on the background information before going into the discussion and reflection questions in the curriculum.

Overwhelmingly, the participants' negative comments from the PF form and during the focus group centered on role-playing. Participants commented that the artificial scenarios and peer audience made them nervous and they struggled to focus on and implement learned strategies. The instructor field notes also showed that many residents grumbled about role-playing and appeared flustered during this part of the session. A focus group participant said, "I just can't do role playing. I can't act; I can't produce which is evident...I was so bad. I can't think...I just get flustered and don't know what I'm doing."

Participants and the instructor mentioned several instructional strategies that could be used to improve the program: (a) shorten the readings, (b) provide a summary outline to highlight the main points of the readings, (c) add a knowledge quiz following

the reading to hold residents accountable for the pre-session reading and to check their understanding of the material, (d) provide more opportunities to observe and practice MI-based PA counseling in real world settings, and (e) hold the program earlier in the residency. While the first 3 recommendations are simple adjustments to the curriculum, the last two points would involve adjustments to the entire residency schedule, which would be logistically challenging. The field notes revealed that finding a provider who regularly practiced PAI was difficult and scheduling the residents to observe a role model had not been feasible due to conflicts with other residency requirements. Participants did; however, suggest ways that PAI could be addressed during other parts of the residency. A participant explained,

The problem is that we don't have a lot of time and so we sort of joke about these things that do happen where they take free time away from us and make us do things like SCOPE sessions. I'm just trying to think about ways that you can incorporate it at least once during the intern year, once during second year, and once during third year.

Another participant commented,

We have the pre-clinic conference [to prepare for well-child visits in clinic]. I think someone should talk about physical activity there. I don't remember even one being about physical activity. That way, we're getting these kids into physical activity in clinic.

CHAPTER V

DISCUSSION

The primary purpose of this study was to develop, implement, and evaluate a PAI training program for pediatric residents; particularly focusing on pretest to posttest changes in residents' knowledge, attitudes, and behaviors (KAB). The secondary purpose was to determine residents' perceptions of the instructional strategies.

For the primary purpose, it was hypothesized that residents' knowledge and positive attitudes related to PAI would improve following the training program. For example, Bass and colleagues found that a PAI curriculum for first year medical students significantly increased knowledge and positive attitude (self-confidence, necessity, utility) scores from pretest to posttest (Bass et al., 2004). No studies; however, have examined changes in resident PAI behaviors following a medical education intervention, therefore no hypothesis was proposed. This study confirmed the hypothesis, showing that participants did significantly increase their overall knowledge and positive attitudes related to PAI. Furthermore, it showed that participants significantly increased PA prescription behaviors and reported clinically meaningful rates of PA screening, prescription, and counseling at posttest

Knowledge

Actual knowledge increased significantly from pretest to posttest, and there was a large effect size for the comparison. On the KAB assessment, posttest knowledge was

highest for questions related to the PA guidelines and PA counseling techniques. Additionally, comments on the PF form cited the PA guidelines as the most useful information of the program. These concepts were emphasized during the program because they represented important competencies for the program. Accordingly, multiple instructional strategies addressed PA guidelines and PA counseling techniques; including readings, tables, reflection on experiences, discussion cases, and role playing. Conversely, KAB posttest knowledge was lowest for the PA benefits and mechanisms. In support of this finding, instructor field notes indicated that participants were generally not familiar with the non-cardiometabolic benefits of PA, nor any of the mechanisms for the benefits of PA. Very little session time was spent discussing the PA benefits and mechanisms as it was assumed that participants would learn this background information from the readings. However, instructor field notes indicated that most participants didn't seem to do the reading. In their book on curriculum development for medical education, Kern and colleagues advised that readings are an appropriate and efficient instructional strategy for knowledge gains, but require high participant motivation to be effective (Kern et al., 2009). In the future, the curriculum should include tools to boost reading motivation, such as a mandatory quiz at the end of the online reading or a problem-based assignment that requires participants to apply the reading content to solve the problem (Kern et al., 2009).

Another interesting knowledge finding was that most participants reported previous training in PAI; however, at pretest their actual knowledge and their attitude about their perceived knowledge was low. It's possible that participants felt they had relevant

training because they learned about general PA health benefits and recommendations in other courses or rotations. However, field notes indicated that none of the participants actually had a course or program where they gained specific knowledge and skills for these PAI strategies. It's also possible that the order of questions on the KAB influenced their responses. The KAB sections in order were: (1) participant characteristics (including the question about previous training), (2) knowledge, (3) attitudes, and (4) behaviors. So participants may have felt they had relevant PA training when completing the participant characteristics section first; but when they struggled with the subsequent knowledge questions (the mean score was 4 out of 10), this may have biased their perceived knowledge attitudes in the direction of a lower response.

Attitudes

There was a significant pretest to posttest increase in PAI attitudes. Follow-up univariate comparisons on the attitudes constructs showed a significant increase in perceived knowledge and a near significant increase in feasibility. A clinically meaningful goal for the program was to reach a sample mean of 3 or higher on each attitudes construct for each PAI strategy. The attitude questions contained a 4-point Likert scale with tags such as the following: 1-not necessary, 2-somewhat necessary, 3-necessary, 4-very necessary. Therefore, a score of 3 or higher indicated positive attitudes related to the various PAI strategies.

Perceived Knowledge

The significant increase in positive PAI attitudes was mostly driven by changes in perceived knowledge. Although perceived knowledge scores increased significantly for

all 4 PAI strategies, all scores were low at pretest (≤ 2) and the only posttest score that reached 3 was for PA prescription. This finding suggests that participants feel they still need more training or repeated training in PAI. For example, participants reported that PAI training should come earlier in their residency and be addressed in multiple contexts such as the pre-clinic conference and SCOPE sessions, as well during the community rotation. One participant commented, “I’m just trying to think about ways that you can incorporate it at least once during the intern year, once during second year, and once during third year.” Additionally, participants may need alternative instructional strategies, particularly in PA counseling and community resource support, which require repeated real-life experience to refine skills (Kern et al., 2009).

There are a few possible reasons for why PA prescription achieved the highest posttest perceived knowledge score. First, considerable session time was spent discussing the PA guidelines, which covered PA parameters such as frequency, intensity, time, and type (FITT) that go into a PA prescription. Second, on the posttest knowledge test, one of the highest mean item scores was on the question related to PA guidelines. Therefore, participants may have had higher perceived knowledge attitudes for PA prescription because they knew the correct PA prescription-related answers on the previous knowledge section. Third, on the PF form participants routinely commented that the most useful information from the program was learning the PA guidelines.

Necessity

Despite large gains in actual knowledge and perceived knowledge, necessity of PAI did not increase significantly. However, the PAI necessity score was high at both pretest

and posttest suggesting there was a ceiling effect. Interestingly, even though participants didn't know all the benefits of PA or mechanisms for these benefits, they still responded high on PAI necessity. It's possible that there was a social desirability bias where participants over-reported their valuation of PAI to present more positively to the instructor; however, participants were repeatedly informed that their responses were de-identified to the instructor. Furthermore, the necessity finding is consistent with Bass and colleagues (2004) who also showed that pretest necessity scores were high at pretest (6.3 out of 7) and did not change significantly at posttest (6.2 out of 7).

Based on effect size, the largest increase in necessity occurred for PA prescription, which was also the PAI strategy that had the highest actual knowledge and perceived knowledge scores at posttest. These findings suggest that increasing knowledge is an important strategy for increasing necessity. While PA prescription increased the most, PA screening had the highest posttest mean at 3.92. Pretest and posttest PA screening necessity scores may have been high because the residents already had a PA screening protocol in place for well-child visits, indicating that their practice already viewed this strategy as a necessity.

Feasibility

Feasibility was nearly significant in the pretest to posttest comparison, but only PA screening and PA prescription achieved a mean item score of 3 at posttest. Qualitative data showed that numerous barriers to PAI exist in the health care system and among patients, which may have lowered participants' perceptions of PAI feasibility, particularly for more time and resource-intensive PA counseling and community resource

support. Participants cited several health care system barriers to PAI, including lack of time, few resources (e.g., community referral resources, efficient screening technology), inadequate training, and low self-efficacy for changing patient PA behaviors. These are consistent with barriers cited in the literature (Rowland et al., 2007; Lobelo et al., 2009). Additional health care barriers mentioned in previous literature are, low motivation (i.e., physicians don't think it should be their role), low self-efficacy (i.e., physicians don't think patients will change behaviors), lack of reimbursement, few PAI role models, and low physician PA level (Rowland et al., 2007; Lobelo et al., 2009). In this study, 69% of participants met the HHS PA guidelines for their personal PA levels (compared to 43.5% of adults), which may be a factor in their high PAI behavior rates. Participants also cited several patient barriers, including sociocultural issues such low income, unsupportive caregivers, unsafe PA environments, and low PA motivation and compliance; and physical issues such as obesity and comorbidities.

In the future, the curriculum could address some of these barriers by providing residents with more tools and resources, such as: (a) web-based screening and prescription tools so these tasks can be completed prior to the visit or in the waiting room; (b) a counseling script or prompts to guide residents through asking key MI-based PA counseling questions; and (c) a paper or web-based community resource guide that residents could use to refer patients to local parks, sports programs, fitness programs, and active games for home. Finally, this curriculum could increase feasibility by scheduling observation and practice with PAI role models; which has been successful in enhancing feasibility in a nutrition counseling residency curriculum. Gonzales and Gilmer (2006)

developed a nutrition counseling curriculum for 2nd year residents in a community rotation with the goal of increasing knowledge, attitudes, and skills. As part of the curriculum, they arranged for residents to observe and assist the pediatric nutritionist in providing nutrition assessment and counseling in the obesity clinic. Furthermore, the pediatric nutritionist scheduled a formal observation and assessment of the resident providing nutrition assessment and counseling for a preselected pediatric patient and their family. These instructional strategies were very effective in improving residents' attitudes for obesity and nutrition counseling, despite similar health care system and patient barriers for this content area.

Confidence

The previously cited patient barriers may have also led to participants' low confidence that PAI will change patient PA behaviors. Posttest confidence scores did not increase significantly and were below 3 for all PAI strategies, meaning that participants were only somewhat confident that PAI could change patient PA behaviors. The low confidence scores and persistent reporting of patient barriers may be a reflection of the high risk population that residents are seeing in clinic. During their clinic shift, participants primarily see low-income patients who do not have an established healthcare provider and/or who do not attend all scheduled well-child visits. Therefore, during a given visit residents may need to provide multiple well-child services that are overdue, reducing the time available to address PAI. Furthermore, participants reported that non-compliance such as missing scheduled appointments is common, suggesting that motivation is low and barriers are high for the population that residents are serving.

Behaviors

Despite low feasibility and confidence scores, most PAI behaviors were higher than in previous literature (Glasgow et al., 2001, Abramson et al., 2000). However, only PA prescription increased significantly. It's possible that with a larger sample size, more of the comparisons would be significant. Nonetheless, there was a very large effect size for PA screening and prescription and a medium effect size for PA counseling and community resource support.

At 2 weeks posttest, participants reported providing PA screening to 98% of patients, prescription to 98% of patients, counseling to 73% of patients, and community resource support to 12% of patients. Glasgow and colleagues (2001) surveyed a national sample of adult patients about their health care experiences in the past year to examine prevalence of various PAI strategies. The results showed that 56% of patients received PA screening, 28% received PA prescription, and only 11% received PA counseling from their physician. Although this study did not examine pediatric patients, it is a useful comparison because it is the only study that differentiated the types of PAI. Unfortunately, most surveys used the term PA counseling to encompass everything from screening to prescription to actual counseling (Abramson et al., 2000; Lobelo et al., 2009). The 2007 National Ambulatory Medical Care Survey (USDHHS, 2007); however, did specifically assess PA counseling among youth and adults separately. This study indicated that only 7.8% of youth and 7.5% of adults received primary care-based PA counseling; suggesting that, at least for PA counseling, the youth and adults rates are similar. Looking at the data another way, Walsh and colleagues (1999) assessed the

percentage of family practice or internal medicine physicians who provided PA screening, prescription, and counseling to more than 50% of their patients; and their results were 66%, 14%, and 43% respectively. Moreover, Abramson and colleagues (2000) found that 12% of pediatricians reported counseling more than 60% of patients on “the benefits of physical activity.” In that study, their use of the term PA counseling is not operationally defined, and is probably not as comprehensive as in the current study. Nonetheless, in the current study, 100% of participants provided PA screening and PA prescription to more than 60% of their patients, and 71% provided PA counseling to more than 60% of their pediatric patients.

Even at pretest, participants’ PAI behaviors were higher than rates reported in the literature (PA screening = 82%, PA prescription = 44%, PA counseling = 55%, PA community resource support = 4%). This might be due to the “5-3-2-1-Almost None!” campaign that incorporated PA screening and PA prescription posters into clinic protocols. Additionally, while rates for most PAI strategies did not increase significantly from pretest to posttest, participants’ PAI skills may have improved and become more MI compliant at posttest. Focus group participants provided insights on how the MI fidelity of their PAI skills improved. One participant explained,

Before the program I was like “are you getting an hour of physical activity a day?” and they say “well sorta, kinda” and I just checked it off, but now after this [program] I will actually go in and figure out what they’re doing.

Participants also reported that they switched from “telling” patients which activities to try and how overcome barriers to asking them what activities they were interested in and

asked them to brainstorm how they could overcome their barriers. In the future, the curriculum could include a portfolio assignment where participants keep field notes on how they provide PAI for patients (Taylor & Swing, 2010). These field notes could serve as a fidelity check to determine whether the use of PAI skills conforms to the recommended guidelines. Furthermore, the curriculum could include instructor observation of the resident providing PAI during an actual well-child visit. These observations; however, would be challenging to schedule and may prohibit an authentic interaction because the resident would know they were being observed and evaluated.

Instructional Strategies

For the secondary purpose to evaluate participants' perceptions of the instructional strategies, only qualitative methods were employed. This research question was included to help the program instructor refine the curriculum for future participants. The PAIPPC curriculum was designed to reflect a competency-based educational framework, as recommended by ACGME. Taylor and Swing (2010) described the following characteristics of competency-based medical education: (a) explicit and aligned with expected competencies; (b) criteria-driven, (c) focused on accountability to benchmarks, guidelines, and clinical evidence; (d) grounded in "real-life" experiences; (e) fosters the learners' ability to self-assess performance against standards; and (f) individualized, providing more opportunities for independent study. Curricular strategies in this study were well-aligned with the first three characteristics, but were not as effective for the last three characteristics. While participants were encouraged to apply the knowledge and skills to real-life patients, there was no follow-up observation of the actual PAI rate or

fidelity in clinic to help them assess their performance. As mentioned previously, a resident portfolio or instructor observation could possibly be used to measure and provide more individualized feedback on participants' PAI skills.

The PAIPPC curriculum also reflected educational methods described by Kern and colleagues (2007) to differentially address cognitive (knowledge), affective (attitudinal), and psychomotor (behavioral) learning objectives. According to qualitative data, participants reported that the most useful instructional materials were (a) the PA guidelines, (b) PA benefits, (c) Bright Futures Pocket Guide, (d) PA sample counseling questions, and (e) the integrated curriculum. These materials primarily reflect the reading, lecture, and discussion educational methods. Given that these 3 educational methods are best matched to cognitive (knowledge) learning objectives, it makes sense that the largest effects were changes in knowledge. Based on Kerns and colleagues' "matching" matrix (Table 6), to further enhance attitudes, the curriculum could include more reflection and observation of role models providing PAI in real life (2007). For example, participants could discuss how they applied PAI knowledge and skills to recent patients; or they could keep a portfolio to reflect on their use of PAI on real-life patients. Additionally, participants could be scheduled to observe providers who are proficient in PAI. Kern and colleagues (2007) explained that attitudinal changes require exposure to knowledge, experiences, and the views of respected others who confirm the desired attitude (p. 84). For example, Gonzalez and Gilmer (2006) developed a nutrition counseling curriculum for 2nd year residents in a community rotation with the goal of increasing knowledge, attitudes, and skills. In addition to using the readings, reflections,

and discussions as in the current study; they also arranged for residents to observe and help the pediatric nutritionist provide nutrition assessment and counseling in the obesity clinic. Furthermore, the pediatric nutritionist scheduled a formal observation and assessment of the resident providing nutrition assessment and counseling for a preselected pediatric patient and their family. While there would be challenges to scheduling these observations during well-child visits, there are potential opportunities to observe the physical therapist that provides PAI in the Healthy Lifestyles obesity clinic. Residents in the community rotation already observe physician and nutritionist encounters in the Healthy Lifestyles obesity clinic, so it would just be a matter of aligning their PAI observation schedule to times when the physical therapist most commonly has patients. While this instructional strategy would provide great real-life practice, it would still be somewhat different from providing PAI during well-child visits because the obesity clinic visits allot more time for counseling.

The least useful instructional strategies were (a) the readings and (b) role-playing. Participant commented that the readings were too long and proposed that a summary outline or list of key points would be help them determine the information to focus on in their reading. Having a more refined reading would also enhance the usefulness of discussion and reflection questions. In the current curriculum the discussion often tended toward lecture because the participants often failed to do the reading and lacked the background information to contribute to the discussion.

As for the role playing, while it is considered a staple instructional strategy in medical education, both the participants and Kern and colleagues (2007) explained that it

can lack authenticity and make participants feel vulnerable. Alternatives or adjunct strategies to role playing could include simulations where residents are given a hypothetical patient response and then asked, “what would you do/say next to this patient?”. In the current study, this strategy was not built into the curriculum but was used with some success for participants who really struggled with role playing. Another alternative to role playing is to have participants observe a proficient PAI provider and then practice observed knowledge and skills on real-life patients, preferably with some reflection (such as in a portfolio), debriefing by the role model, or performance feedback by the instructor. Again, the challenge to implementing this strategy would be identifying a proficient PAI provider and scheduling residents to see patients who are specifically scheduled for PA counseling in the Healthy Lifestyles obesity clinic since there are limited windows in the rotation schedule.

Limitations

These scheduling challenges allude to some of the inherent limitations to implementing the PAIPPC program in the real world setting of a residency program. In this study, there were limitations related to participant selection, evaluation protocols, and researcher bias. For participant selection, this study used a sample of convenience that was small in size ($n = 13$). Although the sample represented almost the entire cohort ($N = 17$, response rate = 76%) in the pediatrics residency program, it may have lacked generalizability since it was not a randomized sample. On a related note, there may have been a selection bias if the self-selected participants were those residents who were more interested or proficient in PAI. Finally, the majority of residents were planning to go into

a specialty field in pediatrics rather than primary care, which may have lowered their perception of the relevance of the material.

Related to the evaluation protocols, there may have been a social desirability bias where participants artificially inflated their responses on the KAB or during the focus group to appear more positive to the instructor. The researcher tried to overcome this bias by informing participants that their responses were de-identified and thus anonymous to the instructor throughout the program. Also, there may have been a testing effect where participants inflated their attitudes and behaviors responses because they remembered their pretest responses; or they may have improved their posttest knowledge scores because they had seen the questions previously. For the behaviors data, the use of participant self-report measures instead of observation or patient reporting may have reduced the accuracy of the data; however, this type of self-report assessment is commonly used in the PAI literature (Walsh et al., 1999; Abramson et al., 2000; Lobelo et al., 2000). Furthermore, the KAB behaviors section only assessed changes in frequency and not in fidelity of PAI strategies. Most PAI behaviors did not increase significantly, but qualitative data suggests that the residents' fidelity to the recommended PAI standards improved from the program, which may in turn improve PAI efficacy and patient outcomes.

Finally, since the researcher was also the instructor, there may have been bias in how the information was presented and how the responses were evaluated. The researcher/instructor may have "taught to the test" to ensure that participants improved on the KAB assessment. However, since the KAB questions were closely linked to the

competencies, it would be appropriate for the instructor to emphasize certain content in order to achieve the learning objectives for the program. Additionally, the researcher/instructor may have been biased when coding the qualitative data, looking for evidence to support the research hypothesis and ignoring evidence that refuted the null hypothesis. However, the researcher chose certain qualitative methods to minimize this risk. By using directed content analysis for the qualitative data, the coding was deductive and informed by the quantitative findings rather than inductive (Hsieh & Shannon, 2005). The goal for the qualitative evaluation was to explain and deepen the quantitative data rather than introduce novel findings.

Strengths

This study also presented several strengths and improvement over previous literature. First, this study is the only PAI curriculum for pediatric residents with documented evaluation results. Previous PAI curriculum studies have only been conducted on medical school samples. Furthermore, these PAI curricula were generally geared to adult patients, and thus didn't translate well for providers going into pediatric or geriatric practice (Ritchie et al., 2002; Bass et al., 2004). Residency training is a good setting for PAI curricula because residents are actively seeing patients in clinic so they can implement and practice the knowledge and skills immediately.

Second, the evaluation protocols were more comprehensive than in other published PAI curriculum studies. For example, previous PAI studies measured knowledge and attitudes, but not behaviors. Also, no PAI curriculum studies collected qualitative data to help explain the quantitative findings.

Third, this PAI curriculum improved upon previous literature by operationally defining the PAI strategies. Previous literature used the term “PA counseling” as a catch all phrase for PAI. Furthermore, the curriculum operationalized PAI strategies into the existing AAP/Bright Futures framework for screening and anticipatory guidance during well-child visits, thus making the provision of these services more efficient. Finally, this PAI curriculum complemented other programs in the rotation, including ones on motivational interviewing and obesity management. Therefore, the integrated content from these different programs was mutually reinforcing, and provided opportunities to consider and apply the content from different perspectives.

Future Directions

Several future directions for the PAIPPC program were identified and many have been suggested throughout this document. First, the curriculum could utilize alternative instructional strategies to further improve PAI attitudes and behaviors fidelity. Second, the evaluation protocols could be refined to overcome limitations and examine new research questions. Third, the future curriculum could include more tools and resources to help residents overcome PAI barriers. Fourth, the curriculum could be modified and implemented for other health care providers or sectors. In the next section, each of these future directions will be examined more in-depth.

Alternative Instructional Strategies

The results of this study suggest that alternative instructional strategies may be needed to further increase attitudes and improve PA counseling fidelity. Besides the instructional strategies that were already used, Kern and colleagues (2009) recommend

reflection, role models, performance feedback, and real life practice to improve attitudes and behaviors. The curriculum could include more reflection by having participants keep a portfolio where they describe their use of PAI strategies on recent patient cases. Portfolios are also recommended by ACGME because they “fosters the learners’ ability to self-assess performance against standards” which is one of the main characteristic of competency-based education (Taylor & Swing, 2010, n.p.). The portfolio could also be reviewed by the instructor as a fidelity check to determine if the participants PAI behaviors are compliant with the program guidelines. The curriculum could also include performance feedback and a fidelity check by providing opportunities to practice PAI on real life patients and receive feedback via instructor observation (Gonzales et al., 2009). Furthermore, the curriculum could include opportunities to observe PAI role models in the Healthy Lifestyles obesity clinic.

These instructional strategies are also well-matched for improving PAI behaviors (Kern et al., 2009). According to field notes, some participants struggled with using MI compliant PA counseling skills. In addition to providing more real life practice, the curriculum could implement a sample counseling script and simulation exercises (“what would you do/say next” questions) to help participants refine counseling skills.

Refined Evaluation Protocols

To overcome poor recall and social desirability bias, different behaviors measures could be implemented. Some alternative ways to measure PAI behaviors are (a) coded observation (live or recorded) of a well-child visit, (b) audit of a resident’s patient records, (c) coded analysis of residents’ portfolio, and patient survey of residents’ PAI

behaviors (Taylor & Swing, 2010). However, these measures would need to be measured covertly to overcome social desirability bias. Additionally, different analyses could be conducted to examine other research questions. Investigators could use one of the alternative behaviors measures listed above to examine PA counseling fidelity. Using the existing measures, they could examine the interactions among background, knowledge, attitudes and behaviors.

PAI Tools and Resources

Curriculum developers could also enhance attitudes particularly, feasibility and confidence, by creating or identifying tools and resources to make PAI more efficient and help residents overcome PAI barriers. To enhance PA screening efficiency, residents could learn about web-based and clinic-based technologies that allow patients to input health and lifestyle data prior to their appointment or in the waiting room (Glasgow et al., 2004). Some health care-based PAI studies have even used computer modules in the waiting room to collect PA screening data, prescribe PA behaviors, and guide the patient to plan a PA program (Patrick et al., 2001). Curriculum developers could also create or identify a paper or web-based community resource guides that lists local PA opportunities. For example, the Durham County Health Department, in conjunction with the primary investigator, is developing an “activity finder” website where patients can create a filtered list of Durham PA opportunities using search term such as activity (e.g., ball sports, aquatics, playgrounds, etc.), proximity, and fee status (i.e., fee versus free). Residents can use this tool briefly in the clinic to help the patient create a PA plan. Curriculum developers could also set up a modified PA referral scheme (PARS).

Physical activity referral schemes are popular in the United Kingdom where they are subsidized for qualifying patients. Typically, PARS involve referral by a primary care physician to an 8 to 12 week tailored exercise program that includes assessment, monitoring, and supervision (Williams, Hendry, France, Lewis, Wilkinson, 2007). In the Durham community, a modified version of PARS could be implemented with organizations such as Durham Parks and Recreation department and the local YMCA, albeit probably without being subsidized. Both of these organizations have a sliding fee scale where low income patients would get to pay a substantially reduced fee (Durham Parks and Recreation, 2012; YMCA of the Triangle, n.d.). Curriculum developers could identify PAI-based workshop for kids and their families through the hospital's free community health education program. Then, residents could refer patients to the workshop, particularly when they don't have time for counseling during the well-child visit. Development of these tools and resources would require work beyond the scope of simply implementing a PAI curriculum. However, pediatric residents are tasked with completing a community project during their second year, so some of these ideas could be developed by residents as their project and made available for future residents to use or update.

Adapt PAI Curriculum for Other Providers

Another future direction for PAI medical education studies is to adapt the current PAI curriculum for use by other health care providers; including nurses, nurse practitioners, physician assistants, or even allied health workers such as exercise physiologists and health educators. Additionally, a PAI curriculum could be developed

for other primary care-oriented residency programs; including internal medicine, family medicine, and geriatrics. Finally, a pediatric or adult/older adult PAI curriculum could be developed for other phases of medical education, including medical school and continuing medical education (CME).

Given the health care system barriers, further improvements in PAI delivery by pediatricians may be limited. Further research is needed to determine whether primary care physicians and nurses or allied health providers would be more effective in delivering PAI.

Conclusion

This study described the development, implementation, and evaluation of a medical education program in PAI for pediatric residents. The domain content and instructional strategies for this program was gleaned from research on youth PA benefits, efficacy of primary care-based PAI, methods in medical education, and published guidelines from relevant medical/public health organizations on primary care-based PAI. Pretest to posttest changes in PAI knowledge, attitudes, and behaviors (KAB) were examined, along with qualitative data to help explain and illustrate the quantitative findings. The results partially confirmed the hypothesis that the PAI curriculum would increase KAB; however, effects varied across the different attitudes and behaviors constructs. Qualitative data provided evidence for the instructional strategies that were most and least useful to participants. Suggestions were made for future refinements and directions for this PAI curriculum. This study contributes to the literature base because it is the only PAI medical education study that targets pediatric residents.

Based on the promising results from this study, several related projects are in the works. First, the PAI curriculum is being refined for the next cohort of pediatric residents to include some of the alternative instructional strategies and evaluation protocols mentioned previously. Second, the primary investigator is working with the Durham County Health Department on an “activity finder” website that physicians can use to facilitate PA counseling with their patients. Third, a few of the residents from the current study are helping develop PAI tools such as the activity finder website and establishing PARS schemes with local community recreation programs.

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APPENDIX A

CURRICULA FOR PAIPPC PROGRAM

Community Pediatrics and Advocacy Rotation- Physical Activity Interventions in Pediatric Primary Care

Session 1 Curriculum: Background and Rationale for Physical Activity Interventions in Pediatric Primary Care

Competencies:

1. Understand the mechanisms for the relationship between physical activity and various physical and mental health benefits.
2. Describe developmentally appropriate NASPE and HHS guidelines for youth PA.
3. Describe the rationale for providing PA interventions in pediatric primary care to enhance motor development, improve mental health, and reduce risk for obesity and chronic disease risk factors.
4. Understand the correlates of youth PA behavior, especially those that can be addressed through PA interventions in the primary care setting.

Guided Learning Questions:

Instructions: As you read this article consider the following questions

1. Compare the health benefits of PA for adults and youth, particularly focusing on motor development, disease risk reduction, and mental health (Competency 1).
2. Describe the general mechanism(s) for the relationship between PA and each of these health benefits (Competency 1).
3. Given that youth are not typically diagnosed with chronic diseases, what is the rationale for promoting PA in youth (Competency 2)?

4. Based on the NASPE and HHS readings, summarize the youth PA guidelines for the following age groups: infants, toddlers/preschoolers, children, and adolescents (Competency 3).
5. Describe activities kids can do to meet criteria for moderate aerobic, vigorous aerobic, muscle strengthening, and bone strengthening PA (Competency 3)?
6. Describe the most significant correlates of PA for children and adolescents that can be addressed through primary care PA interventions (Competency 4)?

Physical Activity Health Benefits and Guidelines

Physical activity (PA) is associated with a wide range of physical and mental health benefits across the lifespan. Tables 1 and 2 describe these benefits for adults and youth, respectively; as well as the strength of the research evidence and the mechanisms for the relationship between PA and these health outcomes.¹⁻⁶ Due to the extent and strength of the evidence, the National Association for Sport and Physical Education⁷ has published PA guidelines to promote healthy development in infants and toddlers and the US Department of Health and Human Services⁸ has published PA guidelines for youth ages 6-21 years old and adults/older adults >21 years old to reduce their risk for disease (see Table 3). Table 4 outlines the types of activities that will meet youth physical activity guidelines.

Despite the benefits of PA for youth and adults, few meet the PA guidelines according to several nationwide assessments. The 2008 National Health Interview Survey indicated that only 43.5% of adults met the aerobic recommendation, 21.9% of adults met the muscle-strengthening recommendation, and only 18.2% met the objective for both aerobic and muscle strengthening PA.⁹ According to the 2009 Youth Risk Behavior Surveillance System (YRBSS), only 18.4% of adolescents met the aerobic recommendation⁹. Physical activity levels fall dramatically from childhood through adolescence. Pate and colleagues used accelerometers to objectively measure PA in a regional sample of first to twelfth graders. Sixty nine percent of participants accumulated 60 minutes of moderate to vigorous physical activity (MVPA); however, compliance with

guidelines fell dramatically from 100% in the youngest age groups to 29.4% in 10th to 12th graders.¹⁰

Rationale for Physical Activity Interventions in Pediatric Primary Care

Given the extent of health benefit and risk reduction associated with PA, and the low PA levels in the population, several medical organizations have published recommendations or position statements supporting the provision of PA interventions in the primary care setting.¹¹ In 1994, the American Academy of Pediatrics (AAP) published a PA position statement, recommending that pediatricians:¹²

1. Assess by history the frequency, type, and duration of physical activities (i.e., PA screening) during any health supervision visit.
2. Teach the importance of regular moderate-to-vigorous physical activity as a way to prevent illness in adult life.
3. Encourage parents to serve as role models by participating in regular physical activity, ideally with their child as a family.
4. Serve as role models by participating in regular physical activity themselves.
5. Work with community schools, supporting daily physical education in these schools, and promoting moderate-to-vigorous activity tasks in physical education classes.

In a more updated set of recommendations, the 2008 AAP publication *Bright Futures Guidelines for the Health Supervision of Infants, Children, and Adolescents* listed PA as one of the key themes to be addressed routinely during the anticipatory guidance portion of the health supervision visit. In fact, physical activity promotion is listed among the 5 priority topics for each health supervision visit from 2 years to 21 years old.¹³

Compared to adults, children and adolescents are at lower risk for physical inactivity and obesity, and are rarely diagnosed with cardiometabolic and cancer-related diseases. Pediatric screening and intervention for physical inactivity; however, is important because PA habits during childhood and adolescence may track into adulthood.

That is, individuals who are not sufficiently active as adolescents may be more likely to be inactive adults, although this issue needs further research.¹⁴ Furthermore, obesity status, which is strongly linked to physical inactivity, may also track from childhood into adulthood, especially for adolescents.¹⁵ For example, Stark and colleagues found that among 11 year old obese children, 40% were still overweight or obese at age 26.¹⁶

Therefore, the primary rationale for pediatric PA interventions is to prevent or reduce obesity and chronic disease risk factors since the pathological processes that lead to these diseases often start in childhood and adolescence. For example, Armstrong and colleagues reported that coronary artery disease risk factors such as atherosclerotic lesions are evident in anywhere from 5% to 47% of British teenagers, setting them up for significant risk for coronary artery disease as adults.¹⁷ Also, adults who achieve lower peak bone density during their pediatric and early adult years are at much higher risk for osteoporosis and bone fractures as bone density steadily falls in middle to late adult years.¹⁸ Despite the intuitive rationale to promote pediatric PA interventions to reduce adult cardiometabolic diseases (cardiovascular disease, type 2 diabetes, and metabolic syndrome), it is important to note that most (but not all) risk factor reduction in pediatric PA studies is partially mediated by weight or body fat levels. That is, when body weight is statistically controlled, the ameliorative effects of PA on cardiometabolic disease risk factors are generally not evident in kids. In adults; however, PA has a strong effect on cardiometabolic disease risk factors, independent of weight status or weight loss.⁵ Additional chronic disease risks that may begin in youth, such as osteoporosis, are not mediated by weight.

In addition to the effect on obesity and chronic disease risk, the second important reason for pediatric PA interventions is to reduce negative mental health symptoms such as depression, anxiety, and low self-esteem.⁵ For example, in a cross-sectional study, Norris and colleagues found that adolescents who reported greater physical activity experienced significantly less stress and depression symptoms.¹⁹

Table 1.

Strength of Evidence and Mechanisms for the Effects of PA on Health Outcomes for Adults and Older Adults

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Lower risk of early death	Strong	<ul style="list-style-type: none"> • Regular PA reduces risk for chronic disease
Lower risk of cardiovascular diseases; including coronary heart disease, stroke, hypertension, and adverse blood lipid profile (cholesterol and triglycerides)	Strong	<ul style="list-style-type: none"> • PA reduces blood vessel inflammation/ hemostatic biomarkers (High sensitivity c-reactive protein, fibrinogen, soluble intracellular adhesion molecule) • lowers blood pressure via <ul style="list-style-type: none"> ○ reduced sympathetic nervous activity (norepinephrine) which limits the vasoconstriction of arterioles allowing for less peripheral resistance to blood pressure ○ improved vascular health (endothelial dilation) ○ reduced insulin resistance via anti-inflammatory effects of PA • increases HDL via decreased HDL apolipoprotein catabolism and increased lipoprotein lipase activity which converts LDL to HDL • reduces elevated triglycerides via increased lipoprotein lipase activity which is a key enzyme for breakdown of triglyceride-rich lipoproteins • decreases hemoglobin A1c
Lower risk of type 2 diabetes	Strong	<ul style="list-style-type: none"> • PA lowers elevated blood glucose levels <ul style="list-style-type: none"> ○ Single PA bout increases glucose uptake into skeletal muscles via enhanced blood flow in muscle and enhanced transport into the muscle cell via translocation of GLUT-4 receptors to surface of cell ○ Chronic PA increases insulin sensitivity independent of weight change and increases glycogen synthase activity ○ PA also reduces insulin resistance via loss of body fat

Table 1. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Lower risk of metabolic syndrome	Strong	<ul style="list-style-type: none"> • PA reduces insulin resistance via loss of body fat • lowers elevated blood glucose to prevent glycation of LDL and HDL which makes them susceptible to oxidative damage and deposition into vascular endothelium
Lower risk of colon cancer	Strong	<ul style="list-style-type: none"> • PA decreases fecal transit time • decreases ratio of prostaglandins • lowers bile acid secretion or enhanced acid metabolism
Lower risk of breast cancer in women	Strong	<ul style="list-style-type: none"> • PA decreases lifetime exposure to estrogen via <ul style="list-style-type: none"> ○ delayed menarche and fewer ovulatory cycles ○ reduced ovarian estrogen production ○ reduced fat-produced estrogens from lowered body fat ○ increased production of sex-hormone binding globulin resulting in less biologically available estrogen. • reduces ovulatory cycles associated with obesity-related infertility
Lower risk of reproductive cancers (endometrial, ovarian) in women	Endometrial: Moderate Ovarian: Weak	<ul style="list-style-type: none"> • PA decreases body fat <ul style="list-style-type: none"> ○ Carcinogens can be stored in visceral fat and released during fat oxidation
Lower risk of prostate cancer in men	Moderate	<ul style="list-style-type: none"> • PA reduces exposure to testosterone via increased production of sex hormone-binding globulin resulting in lower levels of free testosterone

Table 1. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Lower risk for all cancers	Weak	<ul style="list-style-type: none"> • PA enhances antitumor immune defenses and antioxidant defense systems <ul style="list-style-type: none"> ○ Macrophages, lymphokine-activated killer cells and their regulating cytokines, mitogen-induced lymphocyte proliferation ○ Improves free radical defenses by up-regulating both the activities of free scavenger enzymes and antioxidant levels • decreases levels of insulin and insulin-like growth factors, both of which enhance division of normal cells and inhibit cell death
Prevention of weight gain	Aerobic: Strong Strength: Moderate	<ul style="list-style-type: none"> • Aerobic PA increases non-resting energy expenditure to promote iso-caloric balance • Strength training preserves or increases metabolically active muscle tissue to increase resting energy expenditure • increases free fatty acid utilization at submaximal intensity • lipase enzymes of the fat cells become more sensitive to epinephrine and norepinephrine so less enzymes are needed to positively stimulate the release of fatty acids for utilization
Reduced abdominal adiposity (visceral fat)	Aerobic: Moderate to strong Strength: Weak	<ul style="list-style-type: none"> • Contracting skeletal muscles release myokines which work in a hormone-like fashion, exerting specific endocrine effects on visceral fat • During PA, lipid mobilization from the abdominal area is favored
Improved weight loss, particularly when combined with reduced calorie intake	Aerobic: Strong	<ul style="list-style-type: none"> • See “prevention of weight gain” above • Due to the high volume of PA needed to create a caloric deficit, PA should be combined with dietary restriction to promote further caloric deficit

Table 1. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Weight maintenance after weight loss	Aerobic: Moderate	<ul style="list-style-type: none"> • See “prevention of weight gain” above • PA may help “reset” metabolism by increasing muscle mass and increasing free fatty acid utilization at submaximal intensity
Improved cardiorespiratory fitness	Strong	<ul style="list-style-type: none"> • Aerobic PA increases cardiac output via enhanced stroke volume • increases capillary density and red blood cell count to enhance oxygen delivery • Anaerobic PA enhances lactate tolerance
Improved muscular strength	Strong	<ul style="list-style-type: none"> • Strength training improves neuromuscular control via increased motor units and motor unit recruitment • Strength training increases muscle cell hypertrophy
Better functional health for older adults	Moderate to strong	<ul style="list-style-type: none"> • PA enhances balance • PA enhances strength and endurance to perform activities of daily living
Increased bone density	Moderate	<ul style="list-style-type: none"> • Bone cells respond to mechanical load during PA by improving the balance between bone formation and bone resorption, which in turn builds greater bone mass.
Lower risk of Osteoporosis	Moderate to Strong	<ul style="list-style-type: none"> ○ Mechanical loading occurs through weight bearing, high impact, and resistance activity (osteogenic effect is site specific)
Lower risk of fracture	Hip: Moderate Vertebrae: Weak	<ul style="list-style-type: none"> ○ Critical window for laying down optimal bone density occurs through the mid to late 20’s, increasing bone density and reversing bone loss with PA may occur at a much lower rate outside this age period.
Prevention of falls	Strong	<ul style="list-style-type: none"> • PA enhances balance, flexibility, and strength

Table 1. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Mild protection against Osteoarthritis	Weak	<ul style="list-style-type: none"> • PA may thicken ligaments
Improved management for Osteoarthritis, Rheumatoid Arthritis, and Fibromyalgia	Strong	<ul style="list-style-type: none"> • PA may improve disease-associated physiological impairments; including muscle strength, joint range of motion, proprioception, balance and cardiovascular fitness.
Better cognitive function for older adults	Strong	<ul style="list-style-type: none"> • PA increases brain-derived neurotrophic factor which promotes neurogenesis in hippocampus, and enhances executive function
Reduced depression	Strong	<ul style="list-style-type: none"> • Biological <ul style="list-style-type: none"> ○ PA increases concentration of monoamines (norepinephrine, dopamine, serotonin) ○ Endogenous opiates (endorphins) ○ Increases brain-derived neurotrophic factor (BDNF) which enhances neural cell neurogenesis • Psychosocial <ul style="list-style-type: none"> ○ PA provides opportunities for social interaction ○ Increased mastery and self-efficacy ○ PA serves as a distraction or break from daily stressors
Reduced anxiety	Strong	<ul style="list-style-type: none"> • PA Reduces neural sensitivity to anxiolytic effects • Habitual PA may decrease stress hormones secreted from the HPA axis
Improved sleep quality	Moderate	<ul style="list-style-type: none"> • PA-mediated hyperthermia may increase slow-wave sleep which may be related to better sleep quality. • PA may promote internal drive for energy conservation and tissue repair

Table 2.

Strength of Evidence and the Mechanisms for the Effect of PA on Health Outcomes for Children and Adolescents

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Motor development	Weak	<ul style="list-style-type: none"> • PA promotes neuromuscular control and provides opportunities to express reflexes, especially in infants and toddlers
Improved cardiorespiratory fitness	Strong	<ul style="list-style-type: none"> • Aerobic PA increases cardiac output via enhanced stroke volume • increases capillary density and red blood cell count to enhance oxygen delivery • Anaerobic PA enhances lactate tolerance
Improved muscular strength	Strong	<ul style="list-style-type: none"> • Strength training improves neuromuscular control via increased motor units and motor unit recruitment • Strength training increases muscle cell hypertrophy in adolescents but not children
Improved bone health	Strong	<ul style="list-style-type: none"> • Bone cells respond to mechanical load during PA by improving the balance between bone formation and bone resorption, which in turn builds greater bone mass. <ul style="list-style-type: none"> ○ Mechanical loading occurs through weight bearing, high impact, and resistance activity (osteogenic effect is site specific) • Critical window for laying down optimal bone density occurs from childhood through the mid to late 20's

Table 2. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Improved cardiovascular and metabolic biomarkers (e.g., blood pressure, HDL, Triglycerides)	Strong	<ul style="list-style-type: none"> • PA Reduces blood pressure <u>only</u> in hypertensive youth via <ul style="list-style-type: none"> ○ reduced heart rate leading to lower cardiac output ○ improved vascular function (endothelial dilation) ○ positive adaptations in peripheral vasculature • increases low HDL via decreased HDL apolipoprotein catabolism and increased lipoprotein lipase activity which converts LDL to HDL • reduces elevated triglycerides via increased lipoprotein lipase activity which is a key enzyme for breakdown of triglyceride-rich lipoproteins
Favorable body composition	Strong	<ul style="list-style-type: none"> • Aerobic PA increases non-resting energy expenditure to promote isocaloric balance or deficit • Strength training preserves or increases metabolically active muscle tissue to increase resting energy expenditure • PA increases free fatty acid utilization at submaximal intensity • lipase enzymes of the fat cells become more sensitive to epinephrine and norepinephrine so less enzymes are needed to positively stimulate the release of fatty acids for utilization.
Depression	Moderate	<ul style="list-style-type: none"> • Biological <ul style="list-style-type: none"> ○ PA increases concentration of monoamines (norepinephrine, dopamine, serotonin) ○ Endogenous opiates (endorphins) ○ Brain-derived neurotrophic factor (BDNF) • Psychosocial <ul style="list-style-type: none"> ○ Social interaction ○ Increased mastery and self-efficacy ○ PA serves as a break from daily stressors

Table 2. (continued)

Effect of PA on Health Outcomes	Strength of Evidence	Mechanisms
Anxiety	Weak	<ul style="list-style-type: none"> • PA Reduces neural sensitivity to anxiolytic effects • Habitual PA may decrease the amounts of stress hormones secreted from the HPA axis
Self-concept	Weak	<ul style="list-style-type: none"> • Self-concept: various domains (academic, social, physical) <ul style="list-style-type: none"> ○ Self-concept becomes more differentiated during adolescence as youth evaluate their status against peer ○ PA promotes positive self-concept in physical domains ○ Self-esteem is feelings of worth and is related to self-concept
Cognitive function	Weak	<ul style="list-style-type: none"> • Increases brain-derived neurotrophic factor which promotes neurogenesis in hippocampus, and enhances executive function
Academic achievement	Weak	<ul style="list-style-type: none"> • PA improves concentration, memory, and classroom behavior

Table 3.

Physical Activity Guidelines Across the Lifespan

Infants 0-1 Years (NASPE)

- Infant/caregiver interactions should promote PA through exploring movement and the environment
 - Caregivers should place infant in settings that stimulate movement experiences and active play
 - Infant PA should promote skill development
 - Ensure environment meets/exceeds safety standards
 - All caregivers should understand importance of providing structured and unstructured PA opportunities
-

Toddlers/Preschoolers 1-4 Years (NASPE)

- Toddlers should accumulate 30 minutes of daily structured PA. Preschoolers should accumulate 60 minutes of daily structured PA.
 - Toddlers and Preschoolers should accumulate 60+ minutes of unstructured PA and should not be sedentary for more than 60 minutes at a time (except sleeping)
 - Ensure access to indoor and outdoor areas that meet/exceed safety standards
 - Preschoolers should be encouraged to establish competence in fundamental motor skills
 - All caregivers should understand importance of providing structured and unstructured PA opportunities
-

Children and Adolescents 6-21 Years (USDHHS)

- Youth should perform moderate to vigorous PA for 60 minutes or more daily and vigorous PA at least 3 days per week.
 - As part of their 60 or more minutes of daily PA, children and adolescents should include muscle-strengthening PA on at least 3 days of the week and bone-strengthening PA on at least 3 days of the week
-

Adults >21 Years (USDHHS)

- Adults should perform aerobic PA of moderate intensity for at least 150 minutes/week, or 75 minutes/week of vigorous intensity, or an equivalent combination; and muscle-strengthening activities on 2 or more days per week
-

Table 4.

Types of Physical Activity for Children and Adolescents

Type	Children	Adolescents
Moderate-intensity aerobic	<ul style="list-style-type: none"> • Active recreation, such as hiking, skateboarding, rollerblading • Bicycle riding • Brisk walking • Dancing 	<ul style="list-style-type: none"> • Active recreation, such as canoeing, hiking, skateboarding, rollerblading • Bicycle riding (stationary or road bike) • Brisk walking • Dancing • Housework and yard work, such as sweeping or pushing a lawn mower • Games that require catching and throwing, such as baseball
Vigorous-intensity aerobic	<ul style="list-style-type: none"> • Active games involving running and chasing, such as tag • Bicycle riding • Jumping rope • Martial arts, such as karate • Running • Sports such as soccer, ice or field hockey, basketball, swimming, tennis, x-country skiing • Vigorous dancing 	<ul style="list-style-type: none"> • Active games involving running and chasing, such as flag football • Bicycle riding • Jumping rope • Martial arts, such as karate • Running • Sports such as soccer, ice or field hockey, basketball, swimming, tennis, x-country skiing • Vigorous dancing
Muscle-strengthening	<ul style="list-style-type: none"> • Games such as tug-of-war • Modified push-ups (with knees on the floor) • Resistance exercises using body weight or resistance bands • Rope or tree climbing • Sit-ups (curl-ups or crunches) • Swinging on playground equipment/bars 	<ul style="list-style-type: none"> • Games such as tug-of-war • Push-ups and pull-ups • Resistance exercises with exercise bands, weight machines, hand-held weights • Climbing wall • Sit-ups (curl-ups or crunches)
Bone-strengthening	<ul style="list-style-type: none"> • Hopping, skipping, jumping games such as hopscotch and jumping rope • Running • Sports such as gymnastics, basketball, tennis 	<ul style="list-style-type: none"> • Hopping, skipping, jumping • Jumping rope • Running • Sports such as gymnastics, basketball, tennis

Note: adapted from Chapter 3. Active children and adolescents in *Physical Activity Guidelines for Americans* (USDHHS, 2008).

In a follow-up study, adolescents with high situational stress, depression, and anxiety who participated in a 10 week high intensity physical activity program had a significant reduction in their symptoms, despite experiencing the same high stress circumstances at the end of the intervention.¹⁹ The third rationale for pediatric PA interventions is to promote age-appropriate motor development so individuals are more likely to have positive PA experiences as youth and adults.²⁰ For example, an infant/toddler who is often restrained in an infant swing or stroller may experience later motor development in walking and running and subsequently lag behind peers in transitional and complex (activities) that include these tasks causing negative PA experiences. Youth with negative PA experiences may develop a dislike of physical activity and be less likely to value or seek PA as an adult. The final rationale for youth PA interventions, then, is to establish lifetime PA habits by promoting positive PA experiences through timely motor development and emphasis on fundamental skills and enjoyment.²

Physical Activity Correlates and Sample Primary Care Interventions

Although there are a wide range of individual, social, and environmental reasons for an individual to be physically inactive, there are a few physical activity correlates (i.e., factors associated with physical activity) that are consistently evident among most active and inactive youth (see Table 5).²¹ Furthermore, some of these correlates can be addressed through physical activity interventions (PAI) in the primary care setting. A few PA correlates, such as age and gender, reflect high risk groups who may be in greater need of physical activity interventions. Specifically, females are less likely to be active compared to males and adolescents are less likely to be active compared to children, especially adolescent females. The PA correlates that can be addressed through primary care interventions are (a) self-efficacy, (b) social support by friends and family, and (c) motivation/goal orientation. Self-efficacy refers to “beliefs in one's capabilities to organize and execute the courses of action required to produce given levels of attainments”.²² It is a powerful determinant of behavior because high self-efficacy can help individuals overcome barriers. Bandura described how people develop self-efficacy by interpreting information from four sources: (a) mastery experiences (i.e., personally

overcoming barriers, (b) vicarious experiences (i.e., observing others overcoming barriers), (c) verbal persuasion (i.e., encouragement), and (d) emotional states (e.g., anxiety, excitement) evoked by a behavior. Interventions can increase self-efficacy by (a) encouraging individuals to establish physical activity plans, (b) promoting physical activity experiences that produce positive emotions and avoid negative emotions, and (c) by guiding individuals to focus on mastery experiences or times they have been successful with physical activity in the past.²³

Social support can be provided by family, friends, and even community professionals (e.g., coaches, health care practitioners, etc.). Several forms of social support can be provided to increase physical activity level; including, among others, tangible and intangible social support. Tangible social support can be divided into (a) instrumental (e.g., purchasing equipment/payment of fees and transportation) and (b) conditional (e.g., doing activity with and watching/supervision). Intangible social support can be divided into (a) motivational (e.g., encouragement and praise) and (b) informational (e.g., discussing benefits of physical activity).²⁴ For conditional and motivational support, parents are a more important source of social support for children while peers are a more important source of social support for adolescents.²⁵ Primary care interventions can increase social support by providing physical activity counseling to (a) enhance motivation and positive feelings about physical activity (i.e., emotional/motivational support), (b) prompt parents to provide access and/or transportation to physical activity opportunities (i.e., instrumental support), (c) provide information about health-related physical activity recommendations and community physical activity opportunities (i.e., informational support), (d) prompt parents to participate in physical activity with their child (i.e., conditional support), and (e) to encourage adolescents to seek peers to participate in physical activity opportunities with them (conditional support).

Goal orientation (a form of motivation) can be conceptualized in a number of ways; however, for the purpose of physical activity interventions in primary care, goal orientations can be divided into task and ego goals. A task-oriented person is more likely

to define success or competence in terms of mastery or task improvement and tends to adopt personal criteria of evaluation. An ego-oriented person is more likely to define success or competence through comparison to others such as in winning or outperforming others.² Interestingly, high levels of either goal-orientation (i.e., motivation) are associated with physical activity.²⁶ Therefore, primary care physical activity interventions can use counseling to identify a patient's goal orientation, increase their motivation, and help them plan physical activity opportunities that are aligned with their goal orientation. For example, a female adolescent who is task-oriented but low in motivation may be asked to consider (a) what physical activities she has always wanted to master and (i.e., to identify a task) (b) how she would feel if she mastered that activity (to enhance motivation).

Another factor that is inherently a correlate of physical activity behavior is stage of change or readiness for physical activity. The Stages of Change theory, a construct of the Transtheoretical model, describes an individual's intentions to be physical active as they move through 5 stages of behavioral readiness. Primary care interventions can tailor physical activity counseling to the patient's physical activity stage of change. These stages include precontemplation, contemplation, preparation, action, and maintenance. During precontemplation, individuals are unaware or unwilling to change. They lack or avoid information about the risks of their behavior and consider the drawbacks (i.e. cons) of changing unacceptable. Stage-tailored counseling for individuals in precontemplation might include education to increase knowledge of the benefits or pros of a particular behavior change. During contemplation, individuals are increasingly aware of the risks of their behavior and begin to consider the pros and cons of changing but are still ambivalent. Stage-tailored counseling can help individuals consider the positive and negative aspects of changing physical activity behaviors.

Table 5.

Correlates of Physical Activity in Children and Adolescents*

Van der Horst et al. (1998 to 2005)			Sallis et al. (1970-1998)				
Correlates	No. of Studies Showing Association (+/-)		Summary Code Association ^a	Correlates	No. of Studies Showing Association (+/-)		Summary Code Association ^a
Children	+	-			+	-	
Male	4/4		+	Male	25/31	1/31	+
Age	1/8	1/8	00	Age	9/19	4/19	?
Caucasian	3/12		00	Euro-American	4/11		?
Parental education	2/7	1/7	00	ND			
BMI/skinfolds		2/6	0	BMI	2/31	16/31	?
Single parent	1/5	1/5	00	Single parent	1/4	2/4	0
Sell-efficacy	6/6		+	ND			
Self-perception	0/4		00	Self-esteem	0/6		0
Enjoyment of physical activity	2/4		0	Physical activity preference	3/5		+
Barriers to physical activity		2/6	0	General barriers		3/3	-
Watching tv	1/5	1/5	00	Sedentary time (tv, video, games)	1/15	6/15	?
Parental activity	4/4M 1/4F		+M 00F	ND			
Parental support	4/7		+	ND			
Access to facilities	0/7		00	Access to facilities/programs	3/4		+
ND				Parent overweight/obesity	3/5		+
ND				Physical activity intention	3/5		+
ND				Healthy diet	3/3		+
ND				Time outdoors	3/3		+
ND				Previous physical activity	5/6		+

Table 5. (continued)

Van der Horst et al. (1998 to 2005)			Sallis et al. (1970-1998)				
Correlates	No. of Studies Showing Association (+/-)		Summary Code Association^a	No. of Studies Showing Association (+/-)		Summary Code Association^a	
Adolescents	+	-		+	-		
Male	12/12		+	Male	27/28	+	
Age	1/10	5/10	?	Age	2/27	19/27	-
Caucasian	6/13		0	Euro-American	10/14		+
Socioeconomic status	3/8		0	Socioeconomic status	3/9	1/9	0
Parent education	4/6		+	ND			
BMI/skinfolds		3/7	0	BMI/skinfolds	2/21	6/21	0
Attitude	2/3		+	Attitudes, outcome expectations	3/7		?
Self-efficacy	14/17		+	Self-efficacy	7/13		?
Intention	2/4		?	Intention	6/8		+
Perceived barriers	1/14	6/14	?	General barriers		5/15	0
Perceived benefits	1/7		00	Benefits of physical activity	11/29		?
Sport competence	2/6		00	Perceived competence	2/3		+
Goal orientation/ motivation	4/5		+	Achievement orientation	5/6		+
Self-perception	3/8		0	Perceived physical appearance, body image	3/7		?
Fun/ enjoyment	3/8		0	Enjoy exercise	0/5		00
Depression		2/7	0	Depression		3/4	-
Smoking		1/3	0	Cigarette use			
Television/ sedentary time		1/5	0	Sedentary after school/ on weekend		3/3	-
PE/ school sports	2/2		+	On school sports team	1/3		0
Parental activity	2/8		0	Parent activity, modeling	9/27		0
Family influences	10/15		+	Parental support	2/3		+

Table 5. (continued)

Van der Horst et al. (1998 to 2005)			Sallis et al. (1970-1998)			
Correlates	No. of Studies Showing Association (+/-)		Summary Code Association ^a	No. of Studies Showing Association (+/-)		Summary Code Association ^a
Adolescents	+	-		+	-	
Friend support	5/7		+	4/4		+
Availability of facilities	2/6		0	1/8		00
ND				3/3		+
ND				11/12		+
ND				7/7		+
ND				4/4		+
ND				3/4		+
ND				2/3		+

^a when more than 75% of the associations were in a similar direction. This was coded as + (positive), - (inverse), or 00 (no association). When 50-75% of the associations were in a similar direction, this was coded as +, -, or 0. When exactly 50% of the associations were in a positive or inverse direction, or if there was considerable lack of consistency in the findings, it was coded as ? (inconclusive). ND: not described in the review;

*Reproduced from Van der Horst et al., 2007

During preparation, individuals are making plans for change, and may have already initiated small changes but not yet met the recommended threshold for that behavior. Stage-tailored counseling can support this stage by helping the individual select and plan physical activity opportunities and by fostering self-efficacy and social support. During the action stage, individuals have initiated formal behavior change and are meeting

physical activity guidelines. During the maintenance stage, individuals consistently meet physical activity guidelines for several months and are actively overcoming temptations and barriers to change. Stage-tailored counseling can reinforce physical activity behaviors and help individuals plan for barriers.²⁷ For example, an adolescent who is regularly active on school sports teams could be asked to consider how they will stay active during the summer.

All of these correlates are constructs of multiple, overlapping behavioral and counseling models that attempt to predict or change PA behaviors. These models, including most notably Social Cognitive Theory, Transtheoretical Model, 5A's, and Motivational Interviewing, have been utilized in a few physical activity interventions (PAI) in pediatric primary care. All of these primary care-based PAI studies involved the provision of the following strategies: 1) screening, 2) prescription, 3) counseling, and 4) community resource support to address these physical activity correlates. Table 6 outlines these interventions. This small body of literature suggests that primary care-based PAI are moderately effective.

Physician Physical Activity Promotion Rates and Barriers

Despite strong evidence for the health benefits of youth physical activity, AAP guidelines for the provision of PA interventions in primary care, and evidence of positive effects for PA interventions; physician PA promotion rates are low. For example, Glasgow and colleagues surveyed a national sample of patients about their health care experiences in the past year to examine prevalence of various PA intervention strategies. The results indicated that 56% of patients were asked about their PA behaviors (i.e., screening), 28% reported receiving “advice” about PA from their physicians (i.e., prescription), and only 11% received any counseling about how to formulate a specific PA plan.²⁸

The Healthy People 2020 data source (National Ambulatory Medical Care Survey [NAMCS]) indicated that only 7.8% of youth received primary care-based PA counseling in 2007.²⁹ Accordingly, Healthy People 2020 PA objective 11.2 is to “increase the

proportion of physician visits made by all child and adult patients that include counseling about exercise”.⁹ Bright Futures recommends using motivational interviewing to provide preventive health counseling. Motivational interviewing may be most effective counseling strategy for fostering behavior change because of its emphasis on promoting self-efficacy, building motivation, and enlisting peer and parental support; which are the strongest correlates of pediatric PA level.

There are several barriers to primary care-based physical activity interventions; including, lack of PAI knowledge and skills, low motivation (i.e., don’t feel it’s necessary), low self-efficacy for changing patient PA level, lack of time, concerns about reimbursement, and low practitioner PA level.^{30,31} **The purpose of this training program; therefore, is to overcome several of these barriers by increasing pediatric residents’ knowledge, skills, motivation, and self-efficacy to provide primary care PAI.**

Table 8.

Summary of Pediatric Primary Care PA Interventions

Intervention Study/Design	Participants	Intervention Strategies	Outcome Measures	Results
Healthy Teen Olson et al., 2005 Randomized controlled trial (RCT)	Adolescents 11-20 years old	<ul style="list-style-type: none"> • PA screening via PDA in waiting room • PA prescription • PA counseling using based on SCT and using MI • Only 1 visit 	<ul style="list-style-type: none"> • 7 day recall of # of days of moderate PA (MPA) \geq 30 minutes • Measured at baseline and 6 months 	<ul style="list-style-type: none"> • Intervention group had a significant increase in PA compared to usual care/control group
Ortega-Sanchez et al., 2004 RCT	Adolescents 12-21 years old	<ul style="list-style-type: none"> • Verbal PA screening • PA prescription • Tailored PA counseling using 3A's • Conducted at initial, 6 month, and 12 month visits 	<ul style="list-style-type: none"> • Recall of minutes of non-school PA each day • Active (PA \geq30 minutes on \geq3 days/week) versus inactive group 	<ul style="list-style-type: none"> • There was a significant increase in proportion of intervention participants in active group
PACE+ Patrick et al., 2006 RCT	Adolescents 11-15 years old	<ul style="list-style-type: none"> • computerized PA screening and prescription • computerized stage-tailored PA counseling based on SCT and TTM • physician PA counseling using MI • Handouts/ mailings • Extended counseling by researcher using MI • Conducted at initial visit, 6 months, and via mail/phone during extended intervention 	<ul style="list-style-type: none"> • 7 day recall # of days \geq20 minutes VPA or \geq30 min MPA • accelerometry • 7 day recall of minutes of sedentary behavior 	<ul style="list-style-type: none"> • Intervention group had significant decrease in sedentary behaviors • Intervention males had significant increase in active days/week

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Community Pediatrics and Advocacy Rotation- Physical Activity Interventions in Pediatric Primary Care

Session 2 Curriculum Implementing Physical Interventions in Pediatric Primary Care

Competencies:

- 5) Describe how Bright Futures health supervision guidelines create a framework to integrate physical activity interventions (PAI) into anticipatory guidance.
- 6) Use guides and tools to screen patients for PA level and provide PA prescription.
- 7) Acquire skills to provide PA counseling
- 8) Identify community resources for PA referral (e.g., schools, parks and rec) and ways to partner with community organizations to promote PA.

Guided Learning Questions:

Instructions: As you review this reading consider the following questions.

- 1) According to the Anticipatory Guidance 5 priority topics, during which visits should practitioners address physical activity (Competency 5).
- 2) Select 4 visits (infants, toddlers/preschoolers, children, and adolescents) and identify a few anticipatory guidance (AG) questions you could use to initiate PA counseling during that visit (Competency 6).
- 3) Identify 3 methods or tools that can be used to screen for youth PA (Competency 6).
- 4) Using the FITT parameters (frequency, intensity, time, type) where relevant, describe a developmentally appropriate PA prescription for each of the following age groups: infants, toddlers/preschoolers, children, and adolescents (Competencies 2 and 6).
- 5) Identify the major components of motivational interviewing (Competency 7)?
- 6) From the same 4 visits selected above, identify a few MI-based PA counseling questions you could use following AG question (Competency 7).
- 7) Identify 3 resources in your specific community that you can partner with to promote PA (Competency 8).

8) How would you initiate and foster that partnership (Competency 8)?

Guidelines for PA Interventions in Pediatric Primary Care

The American Academy of Pediatrics (AAP) has published multiple guides and toolkits to promote PAI during primary care health supervision visits (i.e., well visits). These PA guides have been developed through the AAP Bright Futures campaign, which is a national health promotion and disease prevention initiative that addresses children's health needs in the context of family and community and provides resources for improving and maintaining infant, child, and adolescent health (<http://brightfutures.aap.org/>). The 2001 toolkit titled *Bright Futures in Practice: Physical Activity*¹ contains information about the following PA-related concepts, many of which are covered in this training program:

- Importance of PA in motor development
- Health benefits of PA for youth
- How to manage PA for youth with health issues (e.g., asthma)
- Implementation of PA screening tools
- Strategies for providing PA counseling
- Characteristics of effective PA programs, leaders, and coaches
- Partnering with families, schools, and communities to foster youth PA opportunities.

The toolkit advises providers to apply the information in the following ways:

- Incorporate [PA promotion] into each health supervision visit.
- Develop and evaluate [patients'] physical activity programs.
- Implement standards of practice and protocol [to support PA promotion].
- Educate children, adolescents, and their families [about PA].
- Refer families to PA resources.
- Support studies to determine the efficacy of Bright Futures PA guidelines.

Guidelines for PA promotion are also evident in the 2008 AAP publication *Bright Futures Guidelines for the Health Supervision of Infants, Children, and Adolescents*. This document outlines the main components of each health supervision visit: (a) developmental observation, (b) physical exam, (c) screening, (d) immunizations, and (e) anticipatory guidance.² The anticipatory guidance section for each health supervision visit outlines 5 priority topics that physicians should address with their patients and their parent/caregiver. For each health supervision visit from 2 to 21 years old, PA is considered among these 5 priority topics to be addressed during anticipatory guidance. Furthermore, PA is identified as one of 10 key themes to emphasize during all visits. The key themes have been selected because they are relevant for youth throughout their pediatric years and important to families and health care professionals in their mission to promote the health and wellbeing of all children.² Based on these AAP guidelines and toolkits, the anticipatory guidance portion of the health supervision visit can be used as a framework for providing PA promotion.

Definitions for Physical Activity Interventions

Physical activity interventions (PAI) in pediatric primary care may include four components which are operationally defined as follows:

- 1) PA screening: Using computerized technology or written or verbal questions to assess a patient's physical activity level and/or whether they are meeting national physical activity guidelines (e.g., Appendix 1-2).
- 2) PA prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines (e.g., Appendix 3)
- 3) PA counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies (e.g., identifying barriers, considering motivation, making a physical activity plan) to help them implement a lifestyle physical activity plan.

- 4) PA community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playgrounds, sports leagues, active games for the home, advocating for more PE classes)

Physical activity screening questions are often included in a general paper and pencil “health behaviors” questionnaire to be completed by the patient or their parent/caregiver in the waiting area or while waiting in the clinic room. Some practices utilize computerized screening questionnaires that may be completed prior to the visit or in the waiting area. Appendix 1 displays the paper and pencil questionnaire, titled *Your Child’s Health Habits*, used by the pediatric clinics that are part of Duke Children’s Primary Care. Appendix 2 displays the Physical Activity & Nutrition (PAN) Monitoring Form that is provided by the North Carolina Department of Health and Human Services.

Physical activity prescription is often provided verbally if the practitioner notes from the screening form that the patient is not meeting the PA guidelines. Alternatively or additionally, the practitioner can distribute a reminder item such as prescription note, handout (see Appendix 3), sticker, or a magnet that outlines the general PA guidelines using the FITT parameters. Physicians should strive to provide PA screening and prescription for all youth. In the spirit of anticipatory guidance, even kids who are currently meeting the PA guidelines should be reminded of the FITT parameters given that youth PA levels decline with each year of age. Additional PAI components are not necessary unless indicated by screening or the patient or parent has PA-related questions or concerns.

Patients who are not meeting PA guidelines should receive PA counseling and community resource support. Given that recall on the PA questionnaires may be poor, physicians should use their best judgment on whether to provide PA counseling for a kid who reports meeting PA guidelines but shows signs of sedentary lifestyle such as being overweight, having disease risk factors, or reporting excessive screen time. The

practitioner might ask this patient what activities they did in the previous day, which they are likely to remember well enough.

Physical activity counseling can be conducted during the anticipatory guidance portion of the visit and should be limited to ~5 minutes.³ Patrick and colleagues suggest several AG questions and PA counseling concepts that may be discussed during PA counseling¹ (see Appendix 4). The PA counseling questions may be selected and organized according to the practitioner's preferred counseling approach. Among the behavioral counseling approaches, motivational interviewing (MI) is currently one of the most popular for increasing PA level. The goal of MI is to explore ambivalence and elicit motivation for change. This counseling approach is non-judgemental, empathetic, and, most importantly, guiding rather than directive. Instead of giving advice, the counselor guides the individual to consider their own reasons for and against behavior change. The core principles of MI are: (a) express empathy, (b) roll with resistance, (c) develop discrepancy, and (d) support self-efficacy. Practitioners use several techniques to facilitate this guiding approach. Table 1 shows these techniques and how they align with the MI principles. These principles and techniques can also be used to address the youth PA meta-correlates (i.e., motivation, self-efficacy, social support). Appendix A5 shows MI questions for each of these techniques.

During MI-based PA counseling, practitioners are trying to achieve the following evidence-based outcomes:

- assess readiness or importance for changing PA behaviors
- identify barriers for changing PA behaviors
- identify PA motives
- identify PA interests
- identify PA opportunities
- enlist social support (peers, parents, family)
- set PA goals
- assesses confidence in changing PA behaviors
- increase self-efficacy (highlight success, encourage)

Table 1.

Motivational Interviewing Principles and Techniques

Principles	Techniques
Express empathy	Simple reflection Complex reflection Feelings reflection Summary
Roll with resistance	Shifting focus reflection Reframing reflection Agreement with a twist reflection Summary
Develop discrepancy	Double-sided reflection Summary Decisional balance (pros/cons) Importance ruler Values question
Support self-efficacy	Affirmation Confidence/readiness ruler Barriers/solutions

However, rather than ask those questions in order, the practitioner should guide the patient to the questions in a way that promotes self-efficacy, motivation, and ultimately change talk. For example, the practitioner could ask an “interest” question, “What are your favorite physical activities,” followed by a “motives” question, “What do you like about doing that activity.” Then the practitioner could ask a question to build discrepancy, “You said that you really enjoy doing (x) because (y), but you haven’t done (x) lately, why not? This line of questions would hopefully elicit change talk where the patient explores barriers to doing activity x and ways they could overcome those barriers.

Physical activity community resource support is an intuitive extension of PA counseling. During counseling the practitioner asks questions about the types of activities that the patient prefers/enjoys and what the patient enjoys about these types of PA (e.g., spending time with friends). The practitioner can then refer the patient to community opportunities in their preferred type of PA. Some pediatric practices have a community resource guide that lists local recreation opportunities, such as playgrounds, sports leagues, and dance lessons. The practitioner can also refer the patient to ideas for home based PA. It is important that the practitioner does not select the activity or the program for the patient, rather they should provide them with several options and support the patient in making a commitment to a couple of the activities.

The following websites are great resources for practitioners working in the Raleigh-Durham-Chapel Hill area:

- Chillkids.com
- Pecentral.org (lessons/instant activities)
- Kidsplay.com

Another aspect of community resource support is partnering with and advocating through community organizations to promote PA.¹ Some potential partnership/advocacy targets are schools, worksites, and churches. For example, practitioners can work with their local schools to advocate for inclusion of PE and activity-based after school programs; and for opening school recreational facilities to the community during non-school hours. Practitioners can also advocate for active environments in their community by supporting infrastructure changes such as expanded greenways and additional playgrounds. Finally, practitioners can present to community organizations on preventive health behaviors such as PA.

Putting It All Together

Because MI-based counseling is purposefully open and guided rather than directive, the practitioner may feel that it is difficult to arrive at a behavior change plan. Practitioners can also use Appendices 4 and 5 to select MI questions they are comfortable with and create their own PA counseling script. The PA Counseling Checklist (Appendix 6) can be used to help sequence the questions. Through practice, each practitioner will find their own combination of questions that work well in multiple client scenarios. At the conclusion of a PA counseling session many patients will be ready to commit to specific activities and collaboratively plan with the practitioner on how implement a specific PA program. For some patients who are not ready to change their PA behavior; however, the resolution may not be a commitment to increase their PA, but rather a commitment to further consider motivations and barriers to being active.

Case-based Learning

Case 1: Natalie^a

Natalie is Susan and Jacob's first baby. They are the first among their friends to have a baby. They have no family members living nearby. Susan brings Natalie in to see you for her 6-month health supervision visit, and you notice that Susan handles Natalie like a china doll. Natalie exhibits very little head and trunk control. When placed on her stomach, she fusses and raises her head only to see what's in front of her. When a toy is placed in front of her, Natalie looks at the toy but doesn't reach for it. You determine that Natalie's height and weight are normal. She is alert and happy. However, her motor skill development is lagging—most noticeably in head and trunk control. You ask Susan how she and Jacob interact with Natalie. Susan admits that she and Jacob are not very sure of themselves when it comes to holding and playing with Natalie. Susan discloses that she is afraid Natalie might “break” if she lets her move around too much. In fact, Natalie spends most of the day in her infant seat or crib.

Case 2: Charlie^a

Charlie, a quiet 4-year-old boy, and his mother have come to see you for his annual health supervision visit. You notice that Charlie is content to sit in a chair and gaze at whomever is speaking. He has no interest in getting up and looking around or playing with the toys in the room. Charlie's mother is concerned that Charlie is lagging behind his sister in motor skill development. You discover that Charlie and his sister go to different child care providers. Charlie's provider does not promote physical activity, and the children are allowed to spend hours watching television and playing with toys that do not require much physical activity.

On the weekends, Charlie's parents run and bike; however, they place him in a stroller or bike seat. Charlie's mother and father wonder why their child does not seem interested in running or learning how to ride a bike.

Case 3: Alex^a

Alex, a 10-year-old boy, is seeing you for his annual health supervision visit. You ask Alex if he participates in physical activity or sports. Alex replies, "I don't like sports!" His parents explain, "Alex would rather play inside with his cars and trucks, watch TV, or play computer games. He tried basketball last year but couldn't keep up with the other kids." You perform a complete physical examination and review Alex's medical history, growth, and development. He is overweight with a BMI of 20. You reassure Alex's parents that their son is healthy and has no medical or physical conditions that would prevent him from participating in physical activity. You also reassure Alex's parents that some boys develop motor skills more slowly than other boys their age, that children grow at different rates, and that some of Alex's 10-year-old friends may be entering puberty even though Alex hasn't yet.

Case 4: Jane^a

Jane, who is 15 years old, is seeing you for her annual health supervision visit. Jane and her mother first fill out a questionnaire about Jane's physical activity participation and other aspects of Jane's health. The responses indicate that Jane is not physically active. You review her medical and family history and are reminded that depression is evident among a few immediate family members. You discuss the benefits of physical activity, including improving Jane's overall health status and sense of wellbeing. You then recommend that Jane incorporate physical activity into her daily routine.

Case Questions:

- a) How is PA linked to key health and developmental issues for this patient?
- b) What observations, screenings, or symptoms are available to indicate an inactive lifestyle?
- c) What PA guidelines (i.e., prescription) should be communicated to this patient and/or her parent?
- d) What kinds of activities can this patient do to achieve these guidelines?
- e) Which PA correlates should you address for this patient and/or her parent?
- f) Which AG and MI questions would you use for this patient and/or his parent?

^aAdapted from: Physical activity developmental chapters, in *Bright Futures in Practice: Physical Activity*¹

Appendix 2

1. NAME		N.C. Department of Health and Human Services Women's and Children's Health Section				
2. HSIS ID #		Physical Activity & Nutrition Behaviors Monitoring Form				
3. Date of Birth		8. Person Completing Form:				
<table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 20px; text-align: center;">Month</td> <td style="width: 20px; text-align: center;">Day</td> <td style="width: 20px; text-align: center;">Year</td> </tr> </table>		Month	Day	Year	Name _____	
Month	Day	Year				
4. Race: <input type="checkbox"/> 1. White <input type="checkbox"/> 2. Black <input type="checkbox"/> 3. Am. Indian <input type="checkbox"/> 4. Asian <input type="checkbox"/> 5. Native Hawaiian/Other Pacific Islander <input type="checkbox"/> 6. Unknown		Title _____				
Ethnicity: Country of Origin: _____		Date Form Completed ____/____/____				
Hispanic or Latino Origin? <input type="checkbox"/> 1. Yes <input type="checkbox"/> 2. No <input type="checkbox"/> 3. Unknown		9. Patient's Height _____ in Date ____/____/____				
5. Sex <input type="checkbox"/> 1. Male <input type="checkbox"/> 2. Female		10. Patient's Weight _____ lb _____ oz Date ____/____/____				
6. County of Residence		7. Medicaid Number or N/A				
PHYSICAL ACTIVITY/INACTIVITY						
11. ACTIVITY LEVEL - Compared to others of the same age/sex, is your child (are you)?		12. EXERCISE DAYS - On how many of the past 7 days did your child (did you) exercise or participate in physical activity for at least 20 minutes that made you/your child sweat or breathe hard?				
<input type="checkbox"/> 01 - a lot more physically active than most <input type="checkbox"/> 02 - a little more physically active than most <input type="checkbox"/> 03 - Average - same as most <input type="checkbox"/> 04 - a little less physically active than most <input type="checkbox"/> 05 - a lot less physically active than most <input type="checkbox"/> 09 - Don't know/not sure		<input type="checkbox"/> 01 - 1 Day <input type="checkbox"/> 06 - 6 Days <input type="checkbox"/> 02 - 2 Days <input type="checkbox"/> 07 - 7 Days <input type="checkbox"/> 03 - 3 Days <input type="checkbox"/> 08 - 0 Days <input type="checkbox"/> 04 - 4 Days <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 05 - 5 Days				
13. TV WEEKDAY - How many hours of television does your child (do you) watch on the typical school day (week day)?		14. TV WEEKEND - How many hours of television does your child (do you) usually watch on the typical weekend day?				
<input type="checkbox"/> 01 - 1 hour or less <input type="checkbox"/> 05 - 5 hours <input type="checkbox"/> 02 - 2 hours <input type="checkbox"/> 06 - 6 hours or more <input type="checkbox"/> 03 - 3 hours <input type="checkbox"/> 08 - None <input type="checkbox"/> 04 - 4 hours <input type="checkbox"/> 09 - Don't know/not sure		<input type="checkbox"/> 01 - 1 hour or less <input type="checkbox"/> 05 - 5 hours <input type="checkbox"/> 02 - 2 hours <input type="checkbox"/> 06 - 6 hours or more <input type="checkbox"/> 03 - 3 hours <input type="checkbox"/> 08 - None <input type="checkbox"/> 04 - 4 hours <input type="checkbox"/> 09 - Don't know/not sure				
SWEETENED BEVERAGES						
15. SODA TIMES - On a typical day, how many times does your child (do you) drink soda? Do not count "diet" soda.		16. SWEETENED BEVERAGE TIMES - On a typical day, how many times does your child (do you) drink sweetened beverages such as sweet tea, punch, kool aid, sports drinks or fruit drinks? Do not count 100% fruit juices.				
<input type="checkbox"/> 01 - 1 time <input type="checkbox"/> 02 - 2 times <input type="checkbox"/> 03 - 3 or more times <input type="checkbox"/> 08 - None <input type="checkbox"/> 09 - Don't know/not sure		<input type="checkbox"/> 01 - 1 time <input type="checkbox"/> 02 - 2 times <input type="checkbox"/> 03 - 3 or more times <input type="checkbox"/> 08 - None <input type="checkbox"/> 09 - Don't know/not sure				
17. SODA AMOUNT - How much soda or other sweetened beverage does your child (do you) typically drink each time?						
<input type="checkbox"/> 01 - Small glass (4-6 ounces) <input type="checkbox"/> 02 - Medium glass (8-12 ounces) <input type="checkbox"/> 03 - Large glass (16 - 20+ ounces) <input type="checkbox"/> 04 - 1 can (12 ounces) <input type="checkbox"/> 05 - 1 bottle (16 - 20 ounces) <input type="checkbox"/> 08 - Don't typically drink soft drinks or soda <input type="checkbox"/> 09 - Don't know/not sure						
FAST FOOD FREQUENCY		FAT SNACK INTAKE				
18. FAST FOOD - How many times a week does your child (do you) eat food from a fast food restaurant like Burger King, Chick-Fil-A, Bojangles, or Pizza Hut?		19. CHIPS - On a typical day, how many times does your child (do you) eat French fries or chips? Chips are potato chips, tortilla chips, cheetos, corn chips or other snack chips.				
<input type="checkbox"/> 00 - Less than once a week <input type="checkbox"/> 05 - More than 5 times a week <input type="checkbox"/> 01 - Once a week <input type="checkbox"/> 02 - 2 times a week <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 03 - 3 to 5 times a week		<input type="checkbox"/> 01 - 1 time <input type="checkbox"/> 08 - None <input type="checkbox"/> 02 - 2 times <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 03 - 3 or more times				
LOW FAT DAIRY INTAKE						
20. MILK AMOUNT - On a typical day, how many glasses of milk does your child (do you) drink? (A glass is the amount in a small carton at school or an 8 ounce drinking glass.)		21. MILK TYPE - What type of milk does your child (do you) usually drink?				
<input type="checkbox"/> 00 - <1 glass <input type="checkbox"/> 04 - 4 or more <input type="checkbox"/> 01 - 1 glass <input type="checkbox"/> 08 - None <input type="checkbox"/> 02 - 2 glasses <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 03 - 3 glasses		<input type="checkbox"/> 01 - Skim or non-fat <input type="checkbox"/> 05 - Flavored lowfat or skim <input type="checkbox"/> 02 - Lowfat (1/2 - 1%) <input type="checkbox"/> 06 - Flavored 2% or whole <input type="checkbox"/> 03 - Reduced fat (2%) <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 04 - Whole				
FRUIT AND VEGETABLE INTAKE						
22. VEGETABLES - On a typical day, how many servings of vegetables does your child (do you) eat? Do not include french fries.		23. FRUITS - On a typical day, how many servings of fruit does your child (do you) eat?				
<input type="checkbox"/> 01 - 1 serving <input type="checkbox"/> 08 - None <input type="checkbox"/> 02 - 2 serving <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 03 - 3 or more servings		<input type="checkbox"/> 01 - 1 serving <input type="checkbox"/> 08 - None <input type="checkbox"/> 02 - 2 serving <input type="checkbox"/> 09 - Don't know/not sure <input type="checkbox"/> 03 - 3 or more servings				

DHHS 4062 (07/2004) (rev 07/2005)

Appendix 3

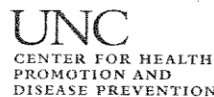


Strategies to Help You & Your Child Be Healthy

- 1. DRINK SKIM OR LOW-FAT MILK.**
 - Choose skim or low-fat milk (except for children under 2).
 - Change slowly from whole milk to 1% or skim.
- 2. LIMIT SUGAR-SWEETENED DRINKS.**
 - Choose water as your #1 beverage for the whole family.
 - Buy less soft drinks like soda, fruit drinks, or sweet tea.
- 3. LIMIT FRUIT JUICE—JUICE IS HIGH IN CALORIES.**
 - Offer juice in small quantities and only once a day.
 - Mix juice with an equal amount of water.
 - Choose 100% juice instead of fruit punch, juice cocktail, or juice blends.
- 4. EAT A HEALTHY BREAKFAST EVERY DAY.**

Choose one of each:

 - GRAIN, like low-sugar cereal or toast
 - FRUIT, like bananas or raisins
 - PROTEIN, like low-fat milk, cheese, yogurt, or peanut butter
- 5. ENCOURAGE YOUR CHILD TO EAT JUST ENOUGH TO SATISFY HUNGER.**
 - Serve smaller portions and allow seconds of healthier foods.
 - Don't insist that your child clean his/her plate.
 - Think about whether your child is really hungry or eating for other reasons.
- 6. LIMIT "JUNK FOOD" SNACKS.**
 - Keep healthy foods available for snacks, instead of cookies, candy, and chips.
 - Bring healthy snacks with you when you go out.
- 7. ENJOY MORE FRUITS AND VEGETABLES.**
 - Choose frozen and canned fruits and vegetables if fresh costs too much.
 - Cut them up and make them easily available on the table or in the fridge.
 - Keep trying new fruits and vegetables and let your child choose—sometimes you have to try up to 10 times for success.
- 8. EAT TOGETHER AS A FAMILY AT LEAST ONCE A DAY.**
 - Serve healthy food at this meal and make it a happy family time.
 - Eat away from the television.
- 9. EAT OUT LESS.**
 - Limit eating out to once per week.
 - Choose restaurants with healthier options, and avoid all-you-can-eat places.
- 10. MOVE MORE—AIM FOR AT LEAST 1 HOUR OF ACTIVE PLAY A DAY.**
 - Choose active toys.
 - Play active games with your child inside and outside.
 - Make helping with household chores a fun activity for your child.
- 11. LIMIT TV AND OTHER SCREEN TIME (COMPUTERS, ETC.) TO NO MORE THAN 2 HOURS PER DAY.**
 - Exercise during commercials when you do watch.
 - Keep the TV out of your child's bedroom.
 - Limit eating in front of the TV and don't let the ads tempt you to eat.
- 12. MOVE MORE—GO OUTSIDE AND PLAY AT LEAST 5 DAYS A WEEK.**
 - Plan outside play time.
 - Work and play outside on the weekends—include neighborhood children.
 - Start your own outdoor family fun day—play basketball, soccer, or catch.



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Contact (919) 966-6080 for inquiries or material requests.

Appendix 4

Anticipatory Guidance (AG) Physical Activity Questions and Counseling Concepts

Infancy 0-11 months

AG questions:

- Do you have any concerns about Julia's development?
- How often do you play with her?
- Do both you and your spouse play with Alexander?
- What are some physical activities you do with him?
- How often during the day is Julia in an open environment, such as on the living room floor?
- Is he interested in his environment? What are his favorite toys? Do toys motivate him to move?
- Do you encourage him to be independent?
- When Alexander is awake, how much time does he spend in an infant safety seat or swing, on the floor, on your lap, or in someone's arms?

PA counseling concepts:

- Suggest participation in parent-infant play groups.
- Infants need the opportunity to move. Encourage parents to provide objects and toys and to play games to encourage their infants to move and do things for themselves.
- Gently turning, rolling, bouncing, and swaying infants are excellent ways to increase their muscle strength and to help them develop important connections between the brain and muscles.
- Tell parents that rough-and-tumble activities are not appropriate for infants. Infants usually signal their distress (e.g., by crying) if the physical activity is too vigorous, overwhelming, or disconcerting. Parents should pay attention to these signals and stop the physical activity if needed.

Early Childhood 1-4 years

AG questions:

- Do you have any concerns about Benita's development?
- How often do you play with her?
- What are some physical activities you do with Ethan?
- How often does he get a chance to run?
- How often does Benita play with a ball?
- How much television do you allow Ethan to watch each day?
- Is your neighborhood safe enough for him to play outside?
- Do you participate in physical activity? If so, which ones?
- Did you participate in physical activity when you were a child?

PA counseling concepts:

- Children should be physically active every day as part of play, games, physical education, planned physical activities, recreation, and sports, in the context of family, school, and community activities.
- Encourage parents to promote daily physical activity (e.g., walking, running, riding a tricycle or bike, dancing, playing with a ball or at the playground, playing on equipment that requires balance, playing games such as "Simon Says").
- Developmentally appropriate organized activities such as tumbling, gymnastics, and dancing are excellent for children if they are taught by qualified, experienced instructors.
- Encourage parents to wait until their children are 6 years old before beginning organized sports. In early childhood, children are too young to understand rules and strategies and to handle the emotional and social stress sometimes associated with organized sports.
- Encourage parents to let children do things for themselves (e.g., letting them climb up into the child safety seat).
- Explain to parents how to encourage their children to participate in physical activity. For example, parents can play with their children before watching television, then gradually extend playtime and decrease television time.
- Encourage parents to participate in physical activity with their children and to be positive role models by participating in physical activity themselves.

- Discuss with parents the importance of using child care providers who promote physical activity and have the space and equipment for it.

Middle Childhood 5-10 years

AG questions for the child:

- Do you think physical activity is important? Why (or why not)?
- Do you think you are getting enough physical activity? Why (or why not)?
- Which physical activities do you participate in? How often? For how long each time?
- Do you participate in physical activities at school? If so, which ones? How often?
- Do you participate in physical activities in your neighborhood? If so, which ones? How often?
- Do you participate in any physical activities with your parents (for example, walking, biking, hiking, skating, swimming, or running)?
- Are there any physical activities you enjoy but don't participate in? If so, which ones? Why?
- Are there any physical activities you don't enjoy? If so, which ones? Why?
- Do you feel that you are good at physical activities? If so, which ones? If not, why?
- Do you think you are in good shape? Can you keep up with your friends and other children your age?
- Do you use appropriate safety equipment when you participate in physical activity? For example, do you use a helmet when you go skate-boarding, skating, or biking?
- How much time each day do you spend watching television and videotapes or playing computer games?

AG questions for the parent:

- Do you have any concerns about Susan's development?
- Do you have questions or concerns about her participation in physical activity?
- Does she participate in regular physical activity daily?
- Does Thomas participate in physical education at school? If so, how often?
- What does he do after school? Does he participate in physical activity?
- Are there any physical activities that Susan enjoys but does not participate in? If so, which ones? Why?

- Are there any physical activities that she doesn't enjoy? If so, which ones? Why?
- During the past 6 months, has Thomas been involved in physical activity programs? If so, which ones?
- Do you feel that Susan is not active enough? If so, why?
- Are there any physical activity programs in Thomas's school or in the community? If so, do you think he would participate if encouraged?
- How can you help him become more active?
- What barriers would make this difficult?
- Do you and Susan participate in physical activities together? If so, which ones? How often?
- How much time each day do you allow her to watch television or play computer games?
- Is your neighborhood safe enough for him to play outside?

PA counseling concepts:

- Children should be physically active every day as part of play, games, physical education, planned physical activities, recreation, and sports, in the context of family, school, and community activities.
- Physical activity is recommended for at least 60 minutes daily. Explain that children can achieve this level of activity through moderate physical activities (e.g., brisk walking for 30 minutes) or through shorter, more intense activities (e.g., skating or playing basketball for 15 to 20 minutes).
- It is critical for children to understand the importance of physical activity. This may encourage them to stay active during adolescence, when their level of physical activity tends to decline.
- Encourage children to find physical activities they enjoy and can continue into adulthood.
- Discuss with parents how children can incorporate physical activity into their daily lives (e.g., by using the stairs instead of taking the elevator or escalator; by walking or riding a bike instead of riding in a car).
- Many elementary schools include physical education in their curricula. Schools that participate in the President's Council on Physical Fitness and Sports program usually conduct testing when children are in middle childhood. Encourage parents to take the results of their

child's fitness test to the health professional to discuss positive results as well as suggestions for improvement.

- Encourage parents to participate in physical activity with their children and to be positive role models by participating in physical activity themselves.

Adolescence 11-21 years

AG questions for the adolescent:

- Do you think physical activity is important? Why (or why not)?
- Do you think you are getting enough physical activity? Why (or why not)?
- Which physical activities do you participate in? How often? For how long each time?
- Do you participate in physical activities at school? If so, which ones? How often?
- Do you participate in physical activities in your neighborhood? If so, which ones? How often?
- Do you participate in any physical activities with your parents (for example, walking, biking, hiking, skating, swimming, or running)?
- Are there any physical activities you enjoy but don't do? If so, which ones? Why?
- Are there any physical activities you don't enjoy? If so, which ones? Why?
- Do you feel that you are good at physical activities? If so, which ones? If not, why?
- Do you think you are in good shape? Can you keep up with your friends and other adolescents your age?
- Do you always have something available to drink during and after physical activity?
- Do you use appropriate safety equipment when you participate in physical activity? For example, do you use a helmet when you go skate-boarding, skating, or biking?
- How much time each day do you spend watching television or playing computer games?

AG questions for the parent:

- Do you have questions or concerns about John's participation in physical activity?
- Does he participate in 60 minutes of physical activity daily?
- Does Rebecca participate in physical education at school? If so, how often?
- What does she do after school? Does she participate in physical activity?
- Are there any physical activities John enjoys but does not do? If so, which ones? Why?

- Are there any physical activities he doesn't enjoy? If so, which ones? Why?
- During the past 6 months, has Rebecca been involved in physical activity programs? If so, which ones?
- Do you feel that John is too active? If so, why?
- Do you feel that he is not active enough? If so, why?
- Are there any physical activity programs in Rebecca's school or in the community? If so, do you think she would participate if encouraged?
- How can you help her become more active?
- What barriers would make this difficult?
- Do you and John participate in physical activities together? If so, which ones? How often?
- How much time each day do you allow him to watch television or play computer games?
- Is your neighborhood safe enough for her to participate in physical activity outside?

PA counseling concepts:

- Adolescents should be physically active every day as part of play, games, physical education, planned physical activities, recreation, and sports, in the context of family, school, and community activities.
- Physical activity is recommended for at least 60 minutes daily. Explain that adolescents can achieve this level of activity through moderate physical activities (e.g., brisk walking for 30 minutes) or through shorter, more intense activities (e.g., jogging or playing basketball for 15 to 20 minutes).
- Encourage adolescents to find physical activities they enjoy and can continue into adulthood.
- Discuss how adolescents can incorporate physical activity into their daily lives (e.g., by using the stairs instead of taking the elevator or escalator; by walking or riding a bike instead of driving or riding in a car).
- Encourage adolescents to participate in a variety of noncompetitive physical activities they enjoy (e.g., biking, in-line skating, jogging, swimming).
- Many adolescents enjoy participating in organized physical activity programs with friends and peers. Adolescents need to choose activities they enjoy and that make them feel competent.

- Encourage adolescents to take on new challenges that will increase their self-confidence (e.g., becoming physically active or learning a new sport). Teach them to set reasonable but challenging goals.
- Encourage parents to participate in physical activity with their adolescents and to be positive role models by participating in physical activity themselves.

Adapted from: *Bright Futures in Practice: Physical Activity* (pp. 16-84)¹

Appendix 5



Sample MI Questions and Statements

Statements for Reflective Listening (Express Empathy):

- "You're feeling uncomfortable with your _____."
- "You are angry with/about _____."
- "You're feeling uncomfortable with your _____."
- "You are angry with/about _____."
- "You've tried to do _____ before and it has not worked for you."
- "You are frustrated with trying to _____."
- "So, if I understand you so far, you _____."
- "You are wondering if you should do something about _____."
- "I can see how you might feel _____ at this point."
- " _____"

Statements and Questions to Develop Discrepancy

- "You have said that you know _____ is the best choice, but that it won't fit with your lifestyle. What are some of your concerns about fitting _____ into your current lifestyle?"
- "What is it about your _____ that others may see as reasons for concern?"
- "What would be the good things about your child (your baby/you) being/having _____?"
- "How has _____ stopped you from doing what you want to do?"
- "How do you feel about _____?"
- "The fact that you are sharing with me indicates that you are interested in learning about _____. Why do you want to learn about _____?"
- "What makes you think that you need to make a change?"
- "If things worked out exactly as you like, what would be different?"
- "If you decided to change, what do you think would work for you?"
- "What concerns do you have about making changes?"
- "What things make you think that this is a problem?"
- "What difficulties have you encountered trying to change your _____?"
- " _____"

Statements and Questions to Roll with Resistance

- "It's okay if you don't think any of these ideas will work for you, perhaps you've been thinking about something that might work instead?"
- "Ultimately, it is your decision. So, what would you like to try?"
- "You are right. I am concerned about your _____, but you are the one in control."

- "You're feeling uncomfortable with your _____."
- "I don't understand everything you are going through, but if you want to share what you've tried, maybe together we can find something that could work for you."
- "Would you like to talk about some ideas that have worked for other moms and use what works for you?"
- " _____ "

Questions to Support Self-efficacy

- "How important is this to you?"
- "How much do you want to _____?"
- "How confident are you that you can make this change?"
- "What encourages you that you can _____, if you want to?"
- "I know that it seems like such an uphill battle to _____, but now that we've discussed some options that have worked for other participants, which ones sound like the best fit for you?"
- "It sounds like you want to continue to _____. What personal strengths do you have that will help you succeed? Who could offer helpful support so you can continue to _____?"
- " _____ "

Statements and Questions for Reinforcing Positive Change-talk and New Behaviors

- "That sounds like a good idea."
- "That's a good point."
- "You are very considerate of how your decisions effect other people."
- "I can see that it's important to you to be a good parent."
- "You've really changed the way you _____. How do you feel about that?"
- " _____ "

Appendix 6

Physical Activity Counseling Outcomes Checklist

Pre PA counseling:

- 1) _____ PA screening
- 2) _____ Anticipatory guidance question(s)
- 3) _____ PA prescription

PA counseling:

- 1) _____ Practitioner assess readiness/importance for changing PA behaviors
- 2) _____ Patient identifies barriers for changing PA behaviors
- 3) _____ **Patient identifies PA motives**
- 4) _____ Patient identifies PA interests
- 5) _____ Practitioner and patient collaboratively identify PA opportunities
- 6) _____ **Patient considers how to enlist social support (peers, parents, family)**
- 7) _____ Patient sets PA goals
- 8) _____ **Patient assesses confidence in changing**
- 9) _____ **Practitioner supports patient's self-efficacy by encouraging them and highlighting their success**

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APPENDIX B

INSTRUCTOR MANUAL

Physical Activity Interventions in Pediatric Primary Care

Instructor Manual

Schedule:

- Pre-session: During the same month but prior to session 1 of this program all residents must attend a separate program on using motivational interviewing to counsel patients on changing health behaviors.
- Pre-test: e-mail Knowledge, Attitudes, Behaviors (KAB) assessment pre-test to all residents before first month of program starts (and before instructional materials are sent)
- Session 1 (90 minutes): Background and rationale for physical activity promotion in pediatric primary care
 - E-mail Session 1 reading to residents one week before session 1.
- Session 2 (90 minutes): Implementing physical activity promotion in pediatric primary care
 - E-mail reading after end of session 1 (session 1 and 2 are 1 day to 1 week apart, depending on the month)
- Session 3 (60 minutes): Practice PA counseling at Active Teens on last Thursday of their month in the rotation, as well as observe Active Teens workout.
- Post-test: send KAB assessment post-test and Participant Feedback form to residents immediately after completion of session 3.

Materials Needed:

- Get e-mail addresses for all residents to send pre/post-tests, readings, and curriculum.
- Upload pre/post tests to Google docs form
- Bring hard copies of all readings and tools for each session
- Get computer and projector to play MI video

Instructional Strategies:

- Lecture (L): Instructor reviews specific knowledge and skill content

- Practice-based discussion prompts (PDP): open-ended discussion questions that are related to the specific knowledge and skills they use in their pediatric practice.
- Guided learning question (GLQ): factual questions to draw their attention to specific knowledge content in the readings.
- Case-based learning: Residents review the details of a specific patient case in order to make observations of symptoms, define the “problem” and come up options for how to resolve the patient’s issues.
- Role play: Residents practice counseling on a simulated patient (fellow resident) and in turn acts as the simulated patient. Role play scenarios are drawn from residents’ real-life practices.

Sequence of Instructional Strategies:

Session 1: Background and Rationale for Physical Activity Interventions in Pediatric Primary Care

L: Introduction

- Brief biographical sketch and research interests
- Definition of physical activity and exercise
- Ask them if they have any experience with health care-based PAI.
- Overview of competencies for this session:
 - Understand the mechanisms for the relationship between PA and various physical and mental health benefits.
 - Describe developmentally appropriate NASPE and HHS guidelines for youth PA.
 - Describe the rationale for providing PAI in pediatric primary care to enhance motor development, mental health and reduce risk for obesity and chronic disease risk factors.
 - Understand the correlates of youth PA behavior, especially those than can be addressed through PAI in the primary care setting.

PDP 1: Consider a recent pediatric patient that presented with a risk factor for chronic disease or had a mental health disorder. What treatment(s) regiment was the patient using to manage their symptoms? Have you ever used physical activity as a complementary therapy for disease management or risk reduction? How could increased PA complement or replace that treatment?

L: PA has numerous health benefits. Look at Tables 1 and 2 to examine the health benefits of PA for adults and youth.

GLQ 1. Compare the health benefits of PA for adults and youth, in particular focusing on motor development, disease risk reduction, and mental health functions.

GLQ 2. Describe the general mechanism(s) for the relationship between PA and a couple of these health benefits, particularly for the conditions you have seen in practice.

L: Some of the health conditions that may be most relevant to address in pediatric practice are

- Obesity: PA is much more effective/important in preventing weight gain than causing weight loss as it is easier to use PA to promote isocaloric balance rather than to burn enough calories to lose clinically significant weight (1 lb of fat = 3500 calories). Among obese adults, 90% have experienced creeping obesity which was due to a caloric excess of ~100 calories/day so increasing PA even a little across the lifespan could have profound effects on obesity rates.
 - However; primary care-based PA promotion most often targets youth who are already overweight.
 - The message here is that practitioners need to provide PA promotion before youth are overweight.
- CVD: many of these (but not all) are mediated by weight loss in youth. However, in adults, the effect of PA remains even when you control for weight.
- Osteoporosis: critical window for peak bone mass during adolescent and early adult years
- Breast cancer: critical window during puberty for age of menarche and estrogen levels
- Depression/anxiety: Research suggests that PA increases BDNF which may improve neural cell health and neurogenesis, possibly causing a cascade effect leading to improved levels of serotonin and other neurotransmitters.

GLQ 3: Notice in the youth table the benefit of motor development. What are some of the key developmental milestones or tasks that are associated with PA for each of the indicated age ranges (infancy, 1-4 years, 5-10 years, 11-20 years)?

PDP 2: What type of screening questions do you use in your practice to assess age-appropriate motor development? So, how does physical activity come into play when you assess or provide guidance on motor development? (You probably don't call it physical activity, but is it?).

L: PA promotion begins with infancy. Rather than advise a specific amount of PA for infants the guidelines suggest that parents provide a safe, activity-friendly environment.

PDP: What environmental factors and safety issues do you discuss with parents to support PA in infancy?

GLQ 4: Once past infancy, how much PA do kids need to achieve these health benefits?

L: See Table 3 and 4 for PA guidelines and explain some nuances

GLQ 5: What are some examples of activities that would count as aerobic? Muscle strengthening? Bone strengthening?

L: Despite the benefits of PA for youth and adults, few meet the PA guidelines according to several nationwide assessments. The 2008 National Health Interview Survey indicated that only 43.5% of adults met the aerobic recommendation, 21.9% of adults met the muscle-strengthening recommendation, and only 18.2% met the objective for both aerobic and muscle strengthening PA (USDHHS, 2009). According to the 2009 Youth Risk Behavior Surveillance System (YRBSS), only 18.4% of adolescents met the aerobic recommendation (USDHHS, 2009). Physical activity levels fall dramatically from childhood through adolescence. Pate and colleagues used accelerometers to objectively measure PA in a regional sample of first to twelfth graders. Sixty nine percent of participants accumulated 60 minutes of moderate to vigorous physical activity (MVPA); however, compliance with guidelines fell dramatically from 100% in the youngest age groups to 29.4% in 10th to 12th graders (Pate et al., 2002).

GLQ 5: What is the role of the physician in promoting PA during primary care visits?

L (if needed): Describe 1994 AAP position statement and 2008 Bright Futures
The AAP recommended that pediatricians:

6. Assess by history the frequency, type, and duration of physical activities (i.e., PA screening) during any health supervision visit.
7. Teach the importance of regular moderate-to-vigorous physical activity as a way to prevent illness in adult life.
8. Encourage parents to serve as role models by participating in regular physical activity, ideally with their child as a family.
9. Serve as role models by participating in regular physical activity themselves.
10. Work with community schools, supporting daily physical education in these schools, and promoting moderate-to-vigorous activity tasks in physical education classes.

More recently, the 2008 AAP publication *Bright Futures Guidelines for the Health Supervision of Infants, Children, and Adolescents* listed PAI (i.e., PA screening, prescription, counseling, and community resource support) as one of the key themes to be addressed routinely during the anticipatory guidance portion of the health supervision visit. In fact, physical activity promotion is listed among the 5 priority topics for each health supervision visit from 2 years to 21 years old.

PDP 3: Does your practice have any protocols for PAI (e.g., screening for PA, prescribing PA, or providing PA counseling)?

GLQ 3: We have examined several health benefits of youth PA as well as the guidelines for youth and practitioners, so what do you think are the strongest reasons for promoting PA in pediatric primary care?

L (if needed):

- Prevent and reduce overweight/obesity
- Reduce and prevent chronic disease risk factors
- Enhance mental health and reduce mental health disorder symptoms
- Improve motor development
- Help youth have positive physical activity experiences and establish PA habits before adolescents and adulthood where PA levels fall dramatically

PDP: What factors influence youth PA levels? Why do youth seek opportunities to be active? Why do youth avoid opportunities to be active?

L: These factors that are related to PA level are called correlates. See Table 5 for strongest youth PA correlates. Explain the main ones that can be modified.

- Self-efficacy
- Peer Social support
- Family/parent social support
- Goal/achievement orientation (task versus ego goal orientation)

These are meta-factors. Many simple PA barriers fall under these meta-factors (e.g., lack of time, lack of access, affordability, inconvenient, uncomfortable). For example, if individuals have greater PA self-efficacy and/or motivation they will find the time. If individuals have support and value the interpersonal relationships that may occur during PA they will be more motivated. Other intervention settings are set up to address simple barriers. For example, schools can address the issue of time and access through PE programs. Worksites can provide PA facilities. Primary care is not going to address these simple barriers. Instead, practitioners can focus on addressing meta-factors. Furthermore, practitioners can help parents and families understand how to address meta-factors for each other.

During the next session we will learn how to use a PA counseling strategy called motivational interviewing (MI). MI provides an effective framework for addressing these meta-factors because rather than “tell” the patient/parent how to be more active, MI-based counseling strives to promote self-efficacy, foster motivation, and enlist social support to increase PA levels.

L: See Table 6 for an overview of intervention studies that have used primary care-based PA promotion to address these correlates.

GLQ 5: What intervention strategies were most common?

PDP 4: Which components of the sample interventions do you currently use in your practice?

L: Despite AAP and Bright Futures guidelines, strong health rationale, and solid evidence for effectiveness of interventions, PAI (especially counseling) in primary care is low. Glasgow and colleagues (2001) surveyed a national sample of patients about their health care experiences in the past year to examine prevalence of various PA counseling strategies. The results indicated that 56% of patients were asked about their physical activity behaviors (i.e., screening), 28% reported receiving “advice” about physical activity from their physicians (i.e., prescription), and only 11% received any counseling about how to formulate a specific PA plan. The Healthy People 2020 data source (National Ambulatory Medical Care Survey [NAMCS]) indicated that only 7.8% of youth received primary care-based PA counseling in 2007. Accordingly, Healthy People 2020 PA objective 11.2 is to “increase the proportion of physician visits made by all child and adult patients that include counseling about exercise (USDHHS, 2009).

GLQ 6: Why are PAI rates low in health care? What are the barriers to primary care-based PA promotion?

L(if needed): lack of PAI knowledge and skills, low motivation (i.e., don’t feel it’s necessary), low self-efficacy for changing patient PA level, lack of time, concerns about reimbursement, and low practitioner PA level

PDP 5: What are the barriers to incorporating these PAI strategies into your primary care practice? How could you overcome those barriers in your practice?

L: Next session we will learn about the specific skills and tools you can use to provide 4 components of PA promotion: screening, prescription, counseling, and community resource support. We will spend most of the time observing an MI scenario and practicing MI-based PA counseling.

Before the next session, please write up a case describing a recent patient that would have benefitted from physical activity promotion. We will use this case to practice PA promotion during the next session.

Session 2: Implementing Physical Activity Interventions in Pediatric Primary Care

Introduction:

- Good to see you! Today we are going to learn about specific skills and tools you can use to provide PAI. The competencies for this session are:
 - Describe how Bright Futures health supervision guidelines create a framework to integrate PAI into the anticipatory guidance portion of health supervision visits.
 - Use guides and tools to screen patients for PA level and provide PA prescription.
 - Acquire skills to provide PA counseling
 - Identify community resources for PA referral (e.g., schools, parks and rec) and ways to partner with community organizations to promote PA.

L: Let's consider a framework for how to integrate PAI into the health supervision visit.

- The AAP publication *Bright Futures Guidelines for Health Supervision of Infants, Children, and Adolescents* outlines the main components that should be a part of each health supervision visit: developmental observation, physical exam, screening, immunizations, and anticipatory guidance (Hagan, Shaw & Duncan, 2008). The anticipatory guidance (AG) section for each health supervision visit outlines 5 priority topics that physicians should address with their patients and their parent/caregiver.
- So rather than treat PAI as an add-on treatment (as many of the intervention studies do), you can integrate it into the AG portion of the health supervision visit as recommended by AAP.

PDP: To what extent do you use the Bright Futures health supervision visit schedule in your practice? How do you implement the anticipatory guidance schedule? Does your practice have software, or do you use paper charts?

GLQ: During which health supervision visits should practitioners provide PAI?

L (if needed): all visits from 2 to 21 years include PA among the 5 priority areas in some way. Additionally, under the AG priority area "infant development" at 4 months and 6 months parents are encouraged to provide interactive playtime and safe space to explore. Furthermore, PA is identified as one of 10 key themes to emphasize during all visits. The key themes have been selected because they are relevant for youth throughout their pediatric years and important to families and health care professionals in their mission to promote the health and wellbeing of all children (Hagan et al., 2008)

L: Let's define PAI. It may have 4 components:

- PA screening: Using computerized technology or written or verbal questions to assess a patient’s physical activity level and/or whether they are meeting national physical activity guidelines
- PA prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines.
- PA counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies (e.g., identifying barriers, considering motivation, making a physical activity plan) to help them implement a lifestyle physical activity plan.
- PA community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playgrounds, sports leagues, active games for the home, advocating for more PE classes)

PDP: Does your practice screen for PA? If so, what does that instrument say/look like?

L: See Appendix 1 for a sample instrument used by the Duke Children’s Primary care clinics, called *Your Child’s Healthy Habits*.

PDP: Do you use this instrument in clinic? How do you use it?

L: Some practices use computerized technology for their health screening, such as computer kiosks or PDAs in the waiting room where patients/parents enter information about multiple health behaviors or even web-based questionnaires that are to be completed prior to the visit.

L: PA screening and PA prescription should occur at each visit. These 2 steps together take one minute. PA prescription is basically giving the patient/parent the FITT parameters. You can do this verbally, or give them a handout (see Appendix 2), or write it on a prescription pad, or make magnets or stickers. If the patient is not meeting PA guidelines you should follow-up with PA counseling and community resource support. Self-reported recall of PA may be poor. Sometimes a patient/parent will report meeting PA guidelines but you suspect that they don’t because they also report excessive screen time or they are overweight. You could ask them what activities they did yesterday to see if they have a good understanding of what “counts” toward PA and to see if they can recall pretty specific details. The next step is PA counseling.

PDP: Give an example of an AG prompted behavior that you currently follow-up with a behavioral counseling intervention (e.g., nutrition, safety). What counseling strategies do you use?

L: We are going to learn how to use to deliver MI-based PA counseling.

PDP: Tell me what you know about MI from that session.

L (if needed): The MI counseling approach is non-judgmental, empathetic, and, most importantly, guiding rather than directive. Instead of giving advice, the counselor guides the individual to consider their own reasons for and against behavior change. Counselors use several techniques to facilitate this guiding approach, including: (1) reflective listening, (2) positive affirmations, (3) supporting self-efficacy, (4) building discrepancy, (5) rolling with resistance, and (6) eliciting change talk (describe each of these techniques). See Appendix 5 for sample questions to reflect each of these techniques.

Watch MI video and identify MI techniques

GLQ: What MI techniques did you pick up from this video? What questions did the practitioner use to reflect these techniques (e.g., reflective listening, affirmations/build self-efficacy, building discrepancy, elicit change talk)

L: In a few minutes we are going to practice MI-based PA counseling, but first let's talk about the 4th component of PA promotion: community resource support.

GLQ: what is PA community resource support?

L (if needed): Physical activity community resource support is an intuitive extension of PA counseling. During counseling the practitioner asks questions about the types of activities that the patient prefers/enjoys and what the patient enjoys about these types of PA (e.g., spending time with friends). The practitioner can then refer the patient to community opportunities in their preferred type of PA. Some pediatric practices have a community resource guide that lists local recreation opportunities, such as playgrounds, sports leagues, and dance lessons. The practitioner can also refer the patient to ideas for home based PA. It is important that the practitioner does not select the activity or the program for the patient, rather they should provide them with several options and support the patient in making a commitment to a couple of the activities.

Another aspect of community resource support is partnering with and advocating through community organizations to promote PA (Patrick et al., 2001). Some potential partnership/advocacy targets are schools, worksites, and churches. For example, practitioners can work with their local schools to advocate for inclusion of PE and activity-based after school programs, and for opening school recreational facilities to the community during non-school hours. Practitioners can also advocate for active environments in their community by supporting infrastructure changes such as expanded greenways and additional playgrounds. Finally, practitioners can present to community organizations on preventive health behaviors such as PA.

PDP: Does your practice have a community resource guide for PA or other health needs?

L: The following websites are great resources for practitioners working in the Raleigh-Durham-Chapel Hill area:

- Chillkids.com
- Pecentral.org (lessons/instant activities)
- Kidsplay.com

PDP: What partnerships could you practice make to advocate for PA in the community? How could you foster that partnership?

Case-based Learning:

L: Now we'll look at some cases. Take a minute to read case 1 and then we'll discuss the subsequent questions. Same for case 2.

L: When using MI and trying to avoid “telling” the person what to do, sometimes it feels like there is no resolution to the counseling. This outcomes checklist will give you some structure and sequence to your questions until you develop a comfortable script that can be applied to different patients.

L: Using the guides and tools in the appendix (AG questions, MI questions, checklist), create a PA promotion “script” for case 3 and 4

Role play to practice PA counseling:

- Use your adapted script to role play a 5 minute MI-based PA counseling scenario with you acting as your patient case or their parent. The instructor will complete the checklist and note questions used as you practice.
- Set a timer to beep at 5 minutes so we stay on time but also so they can learn how to be efficient with their counseling questions.
- The first time through they will wander through questions and not get resolution by the end of 5 minutes. The instructor will highlight what questions/techniques were used, what went well, and where they could improve efficiency.
- Each resident will role play twice, time permitting

APPENDIX C

EVALUATION TOOLS

Physical Activity Interventions Knowledge, Attitudes & Behaviors Pilot Assessment

Instructions: The purpose of this questionnaire is to examine health care practitioners' knowledge, attitudes and behaviors regarding physical activity interventions in primary care. During this pilot study we are trying to refine the meaning and wording of the questions. Please answer all of the questions to the best of your knowledge. As you complete this questionnaire please also consider the following questions about the clarity of the items. There will be space to answer these questions at the end of the questionnaire.

1. How long did it take you to complete this assessment?
2. For what purpose do you think this assessment will be used?
3. Were the instructions clear on how to access and submit the assessment?
4. Were the instructions for each section clear? If not, which section(s) had instructions that were not clear?
5. Was there any wording or language that health care practitioners may not understand? If so, which ones?
6. Did you understand what each question was asking (even if you if not know the correct answer)? If not, which questions were difficult to understand?

Participant Background:

1. Have you had any coursework or training on how to promote physical activity among patients? If yes, please check all that apply.

Yes

Undergraduate class or program
Medical school class or program
Residency program
Continuing education program
Have read article(s)
Other (please describe):

No

2. Have you seen the **5-3-2-1-Almost None** materials created by Duke Children's Primary Care/Healthy Lifestyles?

Yes

No

3. Have you used the **5-3-2-1-Almost None** materials created by Duke Children's Primary Care/Healthy Lifestyles?

Yes

No

4. How many times a week do you usually do 20 minutes or more of vigorous-intensity physical activity that makes you sweat or puff and pant? (e.g., heavy lifting, digging, jogging, aerobics, or fast bicycling).

3 or more times a week

1 to 2 times a week

none

5. How many times a week do you usually do 30 minutes or more of moderate-intensity physical activity or walking that increases your heart rate or makes you breathe harder than normal? (e.g., carrying light loads, bicycling at a regular pace, or doubles tennis).

5 or more times a week

3-4 times a week

1-2 times a week

None

Section 1: Physical Activity Interventions Knowledge

Instructions: Physical activity is defined as any bodily movement produced by skeletal muscles which requires energy expenditure (i.e., calorie burning). Review the case below and then answer each question based on case details and your knowledge of how to promote physical activity in the health care setting.

Case: Sasha is visiting the clinic today for her annual well-care visit. She is 12 years old, normal weight (BMI of 20), and experienced menarche recently. She has recently moved to town and is anxious about starting at a new school and meeting new friends. Although there is a strong history of CVD in her immediate family (mom has hypertension, dad has atherosclerosis) she does not have any other known risk factors for CVD. On her health habits screening form she reports 4 hours of sedentary screen time (tv, computer, etc.) daily and less than 60 minutes of physical activity daily.

1a. Which of the following health benefits may be achieved by increasing Sasha's physical activity to >60 minutes daily?

- a. Decreased blood pressure
- b. Decreased anxiety
- c. Increased bone mass
- d. a. and b.
- e. b. and c.

1b. Was the meaning and wording clear in question 1a?

Yes

No

If no, please briefly explain why:

2a. Although Sasha has a family history of cardiovascular disease, she can reduce her risk of experiencing cardiovascular disease as an adult by the meeting the physical activity guidelines. Physical activity can reduce the risk for cardiovascular disease in adults through which of the following mechanisms?

- a. Physical activity decreases elevated LDL
- b. Physical activity decreases elevated blood pressure
- c. Physical activity decreases elevated triglycerides
- d. a. and b.
- e. b. and c.

2b. Was the meaning and wording clear in question 2a?

Yes

No

If no, please briefly explain why:

3a. You have identified several evidence-based reasons to provide Sasha and her parent with physical activity promotion. Which of the following are valid reasons for providing Sasha and her parent with physical activity promotion?

- a. To enhance her self-concept and academic achievement at her new school.
- b. To help her establish healthy physical activity habits prior to adolescence where the risk for sedentary lifestyle increases.
- c. To help her lose weight
- d. a. and b.
- e. b. and c.

3b. Was the meaning and wording clear in question 3a?

Yes

No

If no, please briefly explain why:

4a. You describe age-appropriate physical activities to Sasha, giving examples of different types of activities that will meet the guidelines for aerobic, muscle strengthening, and bone strengthening activity. Which combination of activities would address all three types?

- a. Swimming and tennis
- b. Dancing and climbing (rockwall, playground, trees)
- c. Bicycling and swimming
- d. a. and b.
- e. b. and c.

4b. Was the meaning and wording clear in question 4a?

Yes

No

If no, please briefly explain why:

5a. You have identified several evidence-based correlates of physical activity for Sasha (i.e., factors related to her physical activity level). Which of the following physical activity correlates would not be relevant to address during physical activity counseling for Sasha and her parent?

- a. The relationship between self-efficacy and physical activity
- b. The relationship between friend support and physical activity
- c. The relationship between appearance and physical activity
- d. a. and b.
- e. a. and c.

5b. Was the meaning and wording clear in question 5a?

Yes

No

If no, please briefly explain why:

6a. You assess Sasha's physical activity level as directed by the Anticipatory Guidance schedule for 11-12 year olds. After identifying that she does not meet physical activity guidelines you prescribe the recommended amount of physical activity and provide brief counseling to change her physical activity behaviors. During which other health supervision visits are these physical activity promotion strategies recommended?

- a. All health supervision visits from 9 months old to 10 years old
- b. All health supervisions from 11 years old to 21 years old
- c. All health supervision visits from 2 years old to 21 years old
- d. Health supervision visits at 6 years old and 12 years old
- e. None of the above

6b. Was the meaning and wording clear in question 6a?

Yes

No

If no, please briefly explain why:

7a. You have decided to provide a physical activity prescription for Sasha using the FITT parameters. Which of the following physical activity prescriptions is the most appropriate?

- a. Frequency: 5 days per week, Intensity: vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
- b. Frequency: 7 days per week, Intensity: moderate or vigorous, Time: 30 minutes of structured physical activity per day, Type: aerobic, muscle strengthening, and bone strengthening
- c. Frequency: 7 days per week, Intensity: moderate or vigorous with at least 3 days vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
- d. Frequency: 5 days per week, Intensity: moderate or vigorous with at least 3 days vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
- e. None of the above

7b. Was the meaning and wording clear in question 7a?

Yes

No

If no, please briefly explain why:

8a. When providing Sasha with physical activity counseling using Motivational Interviewing which of the following counseling techniques would be used?

- a. Ask open-ended questions
- b. perform reflective listening
- c. Recommend the best solution
- d. a. and b.
- e. b. and c.

8b. Was the meaning and wording clear in question 8a?

Yes

No

If no, please briefly explain why:

9a. A central component of Motivational Interviewing is developing discrepancy. Which of the following questions or statements could you use to build discrepancy in order to help Sasha change her PA behaviors?

- a. What would be the good things about having you/your child increase your/her physical activity?
- b. How confident are you that you/your child can change your/her physical activity level?
- c. That sounds like a good plan for increasing your/your child's physical activity.
- d. a. and b.
- e. b. and c.

9b. Was the meaning and wording clear in question 9a?

Yes

No

If no, please briefly explain why:

10a. During physical activity counseling Sasha expresses her interest in taking dance-based fitness classes and her discomfort with playing sports. Which physical activity promotion strategies reflect effective community resource support?

- a. Discuss your preference for Zumba over hip hop for improving aerobic fitness
- b. Give her a resource guide that list all the physical activity opportunities in the community
- c. Advocate for her school to enhance their PE offerings to include non-sport activities such as fitness-based dancing.
- d. a. and b.
- e. b. and c.

10b. Was the meaning and wording clear in question 10a?

Yes

No

If no, please briefly explain why:

Please complete all answers in this section before moving onto the next section. You will not be able to return to this section.

Section 2: Physical Activity Interventions Attitudes

Health care-based physical activity promotion may include screening, prescription, counseling, and community resource support. These physical activity promotion strategies are operationally defined below:

Physical activity screening: Using computerized technology or written or verbal questions to assess a patient's physical activity level and/or whether they are meeting national physical activity guidelines.

Physical activity prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines.

Physical activity counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies to help them implement a lifestyle physical activity plan.

Physical activity community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playground, soccer league, zumba class, more PE classes, etc.).

Instructions: Please answer the following questions regarding your attitudes related to these physical activity intervention strategies. Select only one answer.

1. How necessary do you think it is to provide physical activity screening during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

2. How necessary do you think it is to provide physical activity prescription during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

3. How necessary do you think it is to provide physical activity counseling during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

4. How necessary do you think it is to provide physical activity community resource support during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

5. How feasible is it for you to provide physical activity screening during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

6. How feasible is it for you to provide physical activity prescription during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

7. How feasible is it for you to provide physical activity counseling during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

8. How feasible is it for you to provide physical activity community resource support during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

9. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

10. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening and prescription?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

11. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening, prescription, and counseling?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

12. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening, prescription, counseling, and community resource support?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

13. How knowledgeable are you on how to provide physical activity screening?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable
14. How knowledgeable are you on how to provide physical activity prescription?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable
15. How knowledgeable are you on how to provide physical activity counseling?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable
16. How knowledgeable are you on how to provide physical activity community resource support?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable

Evaluating Section 2 of the Questionnaire

Instructions: Please provide a brief answer for each question.

1. Were the instructions for this section clear? If not, why not?
2. Was there any wording or language in this section that health care practitioners may not understand? If so, which ones?
3. Did you understand what each question in this section was asking (even if you if not know the correct answer)? If not, which questions were difficult to understand?

Section 3: Physical Activity Intervention Behaviors

Health care-based physical activity interventions may include screening, prescription, counseling, and community resource support. These physical activity intervention strategies are operationally defined below:

Physical activity screening: Using computerized technology or written or verbal questions to assess a patient's physical activity level and/or whether they are meeting national physical activity guidelines.

Physical activity prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines.

Physical activity counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies to help them implement a lifestyle physical activity plan.

Physical activity community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playground, soccer league, zumba class, more PE classes, etc.).

Instructions: Please answer the following questions regarding your behaviors related to physical activity promotion. For each question indicate the number of well-child patients that you have seen in the past 2 weeks that you provided with the indicated physical activity promotion strategy.

1. In the past 2 weeks, how many well-child visits have you seen in the clinic?

2. In the past 2 weeks, for how many of those well-child visits did you provide physical activity screening?

3. In the past 2 weeks, for how many of those visits did you provide physical activity screening?

4. In the past 2 weeks, for how many of those visits did you provide physical activity counseling?

5. In the past 2 weeks, for how many of those well-child visits did you provide physical activity community resource support?

Evaluating Section 3 of the Questionnaire

Instructions: Please provide a brief answer for each question.

1. Were the instructions for this section clear? If not, why not?
2. Was there any wording or language in this section that health care practitioners may not understand? If so, which ones?
3. Did you understand what each question in this section was asking (even if you if not know the correct answer)? If not, which questions were difficult to understand?

Evaluating the Entire Questionnaire

Instructions: Please provide a brief answer for each question

1. How long did it take you to complete this assessment?
2. For what purpose do you think this assessment will be used?
3. Were the instructions clear on how to access and submit the assessment? If not, why not?

Click the “Submit” button below to return your responses to the researcher.

Physical Activity Interventions Knowledge, Attitudes & Behaviors Assessment Pretest

Participant Background:

1. Have you had any coursework or training on how to provide physical activity interventions among patients? If yes, please check all that apply.
Yes
Undergraduate class or program
Medical school class or program
Residency program
Continuing education program
Have read article(s)
Other (please describe):
No
2. Have you seen the **5-3-2-1-Almost None** materials created by Duke Children's Primary Care/Healthy Lifestyles?
Yes
No
3. Have you used the **5-3-2-2-Almost None** materials created by Duke Children's Primary Care/Healthy Lifestyles?
Yes
No
4. How many times a week do you usually do 20 minutes or more of vigorous-intensity physical activity that makes you sweat or puff and pant? (e.g., heavy lifting, digging, jogging, aerobics, or fast bicycling).
3 or more times a week
1 to 2 times a week
none
5. How many times a week do you usually do 30 minutes or more of moderate-intensity physical activity **or** walking that increases your heart rate or makes you breathe harder than normal? (e.g., carrying light loads, bicycling at a regular pace, or doubles tennis).
5 or more times a week
3-4 times a week
1-2 times a week
none

Section 1: Physical Activity Interventions Knowledge

Instructions: Review the case below and then answer each questions based on case details and your knowledge of physical activity intervention concepts.

Case: Sasha is visiting the clinic today for her annual well-care visit. She is 12 years old, normal weight (BMI of 20), and experienced menarche recently. She has recently moved to town and is anxious about starting at a new school and meeting new friends. Although there is a strong history of CVD in her immediate family (mom has hypertension, dad has atherosclerosis) she does not have any other known risk factors for CVD. On her health habits screening form she reports 4 hours of sedentary screen time (tv, computer, etc.) daily and less than 60 minutes of physical activity daily.

1. Which of the following health benefits may be achieved by increasing Sasha's physical activity to >60 minutes daily?
 - a. Decreased blood pressure
 - b. Decreased anxiety
 - c. Increased bone mass
 - d. a. and b.
 - e. b. and c.
2. Sasha has a family history of cardiovascular disease. She can reduce her risk of developing cardiovascular disease as an adult by increasing her current physical activity levels. Which mechanism(s) explain the effect that physical activity has on reducing cardiovascular disease risk?
 - a. Physical activity decreases elevated LDL
 - b. Physical activity decreases elevated blood pressure
 - c. Physical activity decreases elevated triglycerides
 - d. a. and b.
 - e. b. and c.
3. Which of the following are valid reasons for providing Sasha and her parent with a physical activity intervention?
 - a. To enhance her self-concept and academic achievement at her new school.
 - b. To help her establish healthy physical activity habits prior to adolescence where the risk for sedentary lifestyle increases.
 - c. To help her lose weight
 - d. a. and b.
 - e. b. and c.

4. You explain to Sasha different types of activities that will meet the physical activity guidelines for aerobic, muscle strengthening, and bone strengthening activity. Which combination of activities would address all three types?
 - a. Swimming and tennis
 - b. Dancing and climbing (rockwall, playground, trees)
 - c. Bicycling and swimming

5. During physical activity counseling, which of the following physical activity correlates (i.e., factors associated with physical activity) should you promote to help Sasha change her physical activity behavior?
 - a. The relationship between self-efficacy and physical activity
 - b. The relationship between friend support and physical activity
 - c. The relationship between appearance and physical activity
 - d. a. and b.
 - e. a. and c.

6. You assess Sasha's physical activity level as recommended by the American Academy of Pediatrics/Bright Futures Anticipatory Guidance schedule for 11-12 year olds. After identifying that she does not meet physical activity guidelines you prescribe the recommended amount of physical activity and provide brief counseling to change her physical activity behaviors. During which other health supervision visits are these physical activity promotion strategies recommended?
 - a. All health supervision visits from 9 months old to 10 years old
 - b. All health supervisions from 11 years old to 21 years old
 - c. All health supervision visits from 2 years old to 21 years old
 - d. Health supervision visits at 6 years old and 12 years old
 - e. None of the above

7. You have decided to provide a physical activity prescription for Sasha using the FITT (i.e., frequency, intensity, time, type) parameters. Which of the following physical activity prescriptions is the most appropriate?
 - a. Frequency: 5 days per week, Intensity: vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
 - b. Frequency: 7 days per week, Intensity: moderate or vigorous, Time: 30 minutes of structured physical activity per day, Type: aerobic, muscle strengthening, and bone strengthening
 - c. Frequency: 7 days per week, Intensity: moderate or vigorous with at least 3 days vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
 - d. Frequency: 5 days per week, Intensity: moderate or vigorous with at least 3 days vigorous, Time: 60 minutes+ per day, Type: aerobic, muscle strengthening, and bone strengthening
 - e. None of the above

8. You provide Sasha with physical activity counseling using an approach called Motivational Interviewing. Which of the following counseling techniques reflect the Motivational Interviewing approach?
 - a. Ask open-ended questions
 - b. Recommend the best solution
 - c. Perform reflective listening
 - d. a. and b.
 - e. b. and c.

9. A central component of Motivational Interviewing is developing discrepancy (i.e., internal state of disagreement). Which of the following questions or statements could be used to build discrepancy in order to help Sasha change her physical activity behaviors?
 - a. What would be the good things about having you/your child increase your/her physical activity?
 - b. How confident are you that you/your child can change your/her physical activity level?
 - c. That sounds like a good plan for increasing your/your child's physical activity.
 - d. a. and b.
 - e. b. and c.

10. During physical activity counseling Sasha expresses her interest in taking dance-based fitness classes and her discomfort with playing sports. Which physical activity intervention strategies reflect community resource support?
 - a. Discuss your preference for Zumba over hip hop for improving aerobic fitness
 - b. Give her a resource guide that list all the physical activity opportunities in the community
 - c. Advocate for her school to enhance their PE offerings to include non-sport activities such as fitness-based dancing.
 - d. a. and b.
 - e. b. and c.

Please complete all answers in this section before moving onto the next section. You will not be able to return to this section.

Section 2: Physical Activity Intervention Attitudes

Health care-based physical activity interventions may include screening, prescription, counseling, and community resource support. These physical activity intervention strategies are operationally defined below:

Physical activity screening: Using computerized technology or written or verbal questions to assess a patient's physical activity level and/or whether they are meeting national physical activity guidelines.

Physical activity prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines.

Physical activity counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies to help them implement a lifestyle physical activity plan.

Physical activity community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playground, soccer league, zumba class, more PE classes, etc.).

Instructions: Please answer the following questions regarding your attitudes related to these physical activity intervention strategies. Select only one answer.

1. How necessary do you think it is to provide physical activity screening during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary
2. How necessary do you think it is to provide physical activity prescription during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

3. How necessary do you think it is to provide physical activity counseling during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

4. How necessary do you think it is to provide physical activity community resource support during well-child visits?
 - 1-not necessary
 - 2-somewhat necessary
 - 3-necessary
 - 4-very necessary

5. How feasible is it for you to provide physical activity screening during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

6. How feasible is it for you to provide physical activity prescription during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

7. How feasible is it for you to provide physical activity counseling during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

8. How feasible is it for you to provide physical activity community resource support during well-child visits?
 - 1-not feasible
 - 2-somewhat feasible
 - 3-feasible
 - 4-very feasible

9. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

10. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening and prescription?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

11. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening, prescription, and counseling?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

12. How confident are you that you can change a patient's physical activity behavior by providing physical activity screening, prescription, counseling, and community resource support?
 - 1-not confident
 - 2-somewhat confident
 - 3-confident
 - 4-very confident

13. How knowledgeable are you on how to provide physical activity screening?
 - 1-not knowledgeable
 - 2-somewhat knowledgeable
 - 3-knowledgeable
 - 4-very knowledgeable

14. How knowledgeable are you on how to provide physical activity prescription?
 - 1-not knowledgeable
 - 2-somewhat knowledgeable
 - 3-knowledgeable
 - 4-very knowledgeable

15. How knowledgeable are you on how to provide physical activity counseling?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable
16. How knowledgeable are you on how to provide physical activity community resource support?
1-not knowledgeable
2-somewhat knowledgeable
3-knowledgeable
4-very knowledgeable

Please go onto the next page

Section 3: Physical Activity Intervention Behaviors

Health care-based physical activity interventions may include screening, prescription, counseling, and community resource support. These physical activity intervention strategies are operationally defined below:

Physical activity screening: Using computerized technology or written or verbal questions to assess a patient's physical activity level and/or whether they are meeting national physical activity guidelines.

Physical activity prescription: Using computerized technology or written or verbal advice to instruct a patient on the appropriate frequency, intensity, time, and type (FITT) of physical activity that is recommended to meet national physical activity guidelines.

Physical activity counseling: Using computerized technology or verbal counseling to guide the patient through behavior change strategies to help them implement a physical activity plan.

Physical activity community resource support: Using computerized technology or written or verbal planning to help a patient identify and advocate for physical activity opportunities at home or in their community (e.g., playground, soccer league, zumba class, more PE classes, etc.).

Instructions: Please answer the following questions regarding your behaviors related to physical activity interventions. For each question indicate the number of well-child patients that you have seen in the past 2 weeks that you provided with the indicated physical activity intervention strategy.

1. In the past 2 weeks, how many well-child visits have you seen in the clinic?

2. In the past 2 weeks, for how many of those well-child visits did you provide physical activity screening?

3. In the past 2 weeks, for how many of those visits did you provide physical activity screening?

4. In the past 2 weeks, for how many of those visits did you provide physical activity counseling?

5. In the past 2 weeks, for how many of those well-child visits did you provide physical activity community resource support?

Click the “Submit” button below to return your responses to the researcher.

**Rotation in Community Pediatrics and Advocacy-
Physical Activity Intervention Training
Participant Feedback form**

Instructions: Please circle the most appropriate response for each item and write-in any relevant comments. Thanks for your feedback!

1. The Physical Activity Intervention training covered knowledge and skills that are important for my pediatric practice.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:

2. I feel that I improved my physical activity intervention knowledge and skills as a result of this training.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:

3. This training has prompted me to initiate or change my physical activity intervention behaviors in my pediatric practice.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:

4. This training program was well-organized.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:

5. The instructional materials and activities reflected the current evidence-base in physical activity interventions.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:
6. The instructional materials and activities were effective in helping me to improve my physical activity intervention knowledge and skills.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:
7. The competencies were clearly stated and addressed through the instructional materials and activities.
1-Strongly disagree
2-Disagree
3-Agree
4-Strongly agree
Comments:
8. The most useful part of the Physical Activity Interventions training program was:
9. The least useful part of the Physical Activity Interventions training program was:
10. To improve the Physical Activity Interventions training program I would change the following:

APPENDIX D

FOCUS GROUP QUESTIONS

Focus Group Questions

During your rotation in Community Pediatrics and Advocacy you attended sessions on how to conduct physical activity interventions during the primary care visit. We would like to hear your thoughts about how this program may have impacted your physical activity intervention knowledge, attitudes, and behaviors.

Knowledge:

First, I would like to discuss your physical activity intervention knowledge, or your understanding of the facts and principles of physical activity intervention in primary care.

- What physical activity intervention information did you learn that you did not know before this program?
- What was the most important physical activity intervention information you learned in this program?
- Is there physical activity intervention information you would like to know about that was not covered in this program?

Attitudes:

In the next set of questions, I would like to discuss your attitudes about physical activity interventions. During the program you learned about four physical activity intervention strategies that can be implemented in the primary health care setting: PA screening, prescription, counseling, and community resource support

- Compared to prior to the program, how knowledgeable are you about these physical activity promotion strategies?
- Compared to prior to the program, how necessary do you think it is to implement these physical activity promotion strategies, and why?
- Compared to prior to the program, how feasible is it for you to implement these physical activity promotion strategies, and why?
- Compared to prior to the program, how confident are you that you can implement these physical activity promotion strategies, and why?

Behaviors:

Next, I would like to discuss how these strategies may have been put into practice.

- How have you incorporated these physical activity intervention strategies into your practice, if at all?
- What challenges, if any, have you encountered implementing these physical activity intervention strategies?
- What successes, if any, have you encountered implementing these physical activity intervention strategies?

Instructional Strategies:

Several instructional strategies were used during this program, including a review of the evidence, summary tables of physical activity guidelines and benefits, sample forms and questions, cases, discussion questions, reflections, practice-based prompts, a video, and role playing.

- Which strategies were most useful in helping you improve your physical activity intervention knowledge?
- Which strategies were most useful in helping you improve your physical activity intervention skills?
- Which strategies were most useful in increasing your attitude about the importance and feasibility of physical activity interventions?
- What other instructional strategies would have been helpful to increase your physical activity interventions knowledge and skills.

APPENDIX E
INSTRUCTIONAL DESIGN EVALUATION FORM

Instructional Design Evaluation Form

Evaluator Name	Debra Best, MD
Evaluator Title	Assistant Professor, Pediatrics Course Director for the Community and Pediatrics Advocacy rotation
Department/ organization	Duke University Medical Center

Instructions: Please rate the instructional materials in the following categories using a 5 point rating scale: 1 = poor 3 = satisfactory 5 = excellent

I. INSTRUCTIONAL MATERIAL

Elements	Score	Note
1) Trainer or facilitator manual with:		
a) Planning notes and checklists	5	
b) Needs assessment materials	5	This is an important component
c) Guidance on teaching approaches and learning principles	3	Enhanced teaching principles would be helpful if you want others to be able to deliver this curriculum
2) Summary of key messages/learning	5	
1) Structured curriculum with:		
a) Agenda/schedule	5	
b) Measurable objectives	5	
c) Combination of affective, didactic, and psychomotor domain objectives	5	
d) Teaching methods appropriate to stated objectives	5	
e) Teaching notes	5	
f) Teaching aids and handouts	5	
g) Active learning exercises	5	
h) Directions, including timeframe for facilitating active learning	5	
i) Additional resource and reference materials	5	
Subtotal	63	

II. DOMAIN CONTENT

Element	Score	Notes
1) Accuracy	5	
2) Timeliness or relationship to current guidelines	5	
3) Referenced/evidence based	5	
4) Locally appropriate, adapted to local context	4	Could incorporate more information on Durham physical activity resources
5) Information sequenced from basic to specialized, simple to complex	5	
Subtotal	19	

III. ASSESSMENT METHODS

Elements	Score	Notes
1) Evaluation instrument(s) that measure:		
a) Participant reaction/feedback	5	
b) Participant learning (i.e., knowledge and skills)	5	
c) Participant behavior (i.e., implementation of new knowledge and skills)	4	Residents report their use of these skills; but having an expert observe their implementation of skills would be better
1) Appropriateness and clarity of items		
a) Reflects stated objectives	5	
b) Clarity of wording and question structure	5	
c) Clarity of instructions	5	
Subtotal	29	
Total Score	111	

IV. SUMMARY RECOMMENDATIONS

This is a very thorough curriculum; and most importantly, it evaluates residents' needs and improvements. However, it would be hard for a medical (non-exercise science) provider to deliver it. This curriculum fits into the community rotation well because it builds off some of the other rotation topics.

Instructional Design Evaluation Form

Evaluator Name	Paul G. Davis, PhD, RCEP
Evaluator Title	Associate Professor
Department/ organization	Department of Kinesiology University of North Carolina at Greensboro

Instructions: Please rate the instructional materials in the following categories using a 5 point rating scale: 1 = poor 3 = satisfactory 5 = excellent

I. INSTRUCTIONAL MATERIAL

Elements	Score	Note
3) Trainer or facilitator manual with:		
a) Planning notes and checklists	5	
b) Needs assessment materials	5	
c) Guidance on teaching approaches and learning principles	5	
4) Summary of key messages/learning	5	
2) Structured curriculum with:		
a) Agenda/schedule	5	
b) Measurable objectives	5	
c) Combination of affective, didactic, and psychomotor domain objectives	5	
d) Teaching methods appropriate to stated objectives	5	
e) Teaching notes	5	Good – very thorough
f) Teaching aids and handouts	5	
g) Active learning exercises	5	
h) Directions, including timeframe for facilitating active learning	5	
i) Additional resource and reference materials	5	
Subtotal	65	

II. DOMAIN CONTENT

Element	Score	Notes
6) Accuracy	4	Elaborations at bottom of form.
7) Timeliness or relationship to current guidelines	5	Very good coverage of various guidelines
8) Referenced/evidence based	5	
9) Locally appropriate, adapted to local context	5	
10) Information sequenced from basic to specialized, simple to complex	5	Well-done!
Subtotal	24	

III. ASSESSMENT METHODS

Elements	Score	Notes
2) Evaluation instrument(s) that measure:		
a) Participant reaction/feedback	5	
b) Participant learning (i.e., knowledge and skills)	4	Some multiple choice questions are a bit “picky”. For example, some studies show lowered LDL-cholesterol with exercise training, although finding isn’t conclusive.
c) Participant behavior (i.e., implementation of new knowledge and skills)	5	Using terms like “zumba” may eventually become dated. I would either use more generic language or be prepared to update periodically.
2) Appropriateness and clarity of items		
a) Reflects stated objectives	5	
b) Clarity of wording and question structure	5	
c) Clarity of instructions	5	

Subtotal	29	
Total Score	118	

IV. SUMMARY RECOMMENDATIONS

Overall, this is put together *very* well. Here are opportunities for further improvement:

Lesson 1

- End of Page 3: write in 3rd person (“when *you* control for body weight”).
- End of Page 3: Obesity is a risk factor for colon cancer.
- Reference all tables.
- Table 1: Some terms (e.g., apolipoprotein, GLUT-4) may not be known to all 1st-year med students.
- Table 1: “OA” abbreviation not previously defined.
- A table describing Prochaska’s model might be helpful for those unfamiliar with it.
- Table 6: Some bullets are capitalized while others aren’t.

Lesson 2

- Is “MI” defined?
- Case 3: A BMI of 26 is actually considered obese (not modestly overweight) for a 10-year-old boy. Children actually have different BMI criteria from adults, and they are dependent upon age. The CDC has a website that explains this nicely:
http://www.cdc.gov/healthyweight/assessing/bmi/childrens_bmi/about_childrens_bmi.html

Here is a link to the actual BMI charts:

http://www.cdc.gov/growthcharts/clinical_charts.htm

- Appendix 6, end: I don’t remember seeing much about PA goal-setting and increasing self-efficacy in text; will this come later?

Assessment

- Case description: Same comment as above concerning BMI.

Instructional Design Evaluation Form

Evaluator Name	Sarah Armstrong, MD
Evaluator Title	Assistant Professor, Pediatrics Director, Duke Children's Healthy Lifestyles
Department/ organization	Duke University Medical Center

Instructions: Please rate the instructional materials in the following categories using a 5 point rating scale: 1 = poor 3 = satisfactory 5 = excellent

I. INSTRUCTIONAL MATERIAL

Elements	Score	Note
5) Trainer or facilitator manual with:		
a) Planning notes and checklists	5	Very comprehensive
b) Needs assessment materials	4	Contains many needs assessment materials.
c) Guidance on teaching approaches and learning principles	4	Will be adequate for instructors of many educational levels.
6) Summary of key messages/learning	5	Each section summarized separately and clearly
3) Structured curriculum with:		
a) Agenda/schedule	5	Organized and efficient
b) Measurable objectives	5	Complete
c) Combination of affective, didactic, and psychomotor domain objectives	4	covers all three to varying degrees
d) Teaching methods appropriate to stated objectives	5	Excellent
e) Teaching notes	5	Yes
f) Teaching aids and handouts	4	Appropriate
g) Active learning exercises	5	Throughout
h) Directions, including timeframe for facilitating active learning	5	Very creative
i) Additional resource and reference materials	5	Very comprehensive
Subtotal	61	

II. DOMAIN CONTENT

Element	Score	Notes
11) Accuracy	5	To my knowledge
12) Timeliness or relationship to current guidelines	5	Very!
13) Referenced/evidence based	5	Extensively
14) Locally appropriate, adapted to local context		Comprehensive resource guide for childhood inactivity can never be exhaustive. This is a very good start.
15) Information sequenced from basic to specialized, simple to complex	4	To my knowledge
Subtotal	19	

III. ASSESSMENT METHODS

Elements	Score	Notes
3) Evaluation instrument(s) that measure:		
a) Participant reaction/feedback	4	Yes
b) Participant learning (i.e., knowledge and skills)	5	Yes
c) Participant behavior (i.e., implementation of new knowledge and skills)	4	Stated use in practice
3) Appropriateness and clarity of items		
a) Reflects stated objectives	5	Very precisely
b) Clarity of wording and question structure	5	Yes. See comment #3 below
c) Clarity of instructions	5	Yes
Subtotal	28	
Total Score	108	

IV. SUMMARY RECOMMENDATIONS

- 1) Very comprehensive. All domains/objectives are clearly hit upon and detailed.
- 2) Would love to see this in online module/interactive format.
- 3) This is an outstanding resource. My main concern is WHAT doctor will have the time to comprehensively teach this to medical students/residents. To be useful, it will need to be either broken down into small units, summarized, or turned into a combination of online learning modules plus some didactic review.

APPENDIX F

RECRUITMENT LETTERS

Pilot Study Recruitment Letter

Hi,

You are eligible to participate in a research study titled: *Development and Evaluation of a Training Program in Physical Activity Interventions for Pediatric Residents*.

If you complete this brief online study, you will receive a coupon for 25% off a personal training session or package at the Wilson or Brodie Recreation Centers (prices start at \$25/session) at Duke University.

The purpose of this study is to pilot test a questionnaire that will be used to evaluate medical residents' knowledge, attitudes and behaviors following a training program on how to provide physical activity interventions in primary care.

You may only participate in this study if you are a medical student at Duke University (identifiable in the student directory). To participate, review the informed consent form below and then follow the links to provide electronic authorization for informed consent and to access the online questionnaire. This questionnaire will take approximately 20-30 minutes to complete. Please do not reference any outside resources to complete this questionnaire.

Submit the completed questionnaire by () to be eligible for the personal training coupon!

If you have any questions, please contact one of the investigators listed below.

Kim McNally, MS, EdD candidate
Lecturing Fellow, Duke University Dept. of Health, Wellness, & PE
kmcnally@duaa.duke.edu
919-684-1109

Diane Gill, PhD
Professor, UNCG Dept. of Kinesiology
dlgill@uncg.edu

Formal Study Recruitment Letter

Hi,

As part of your rotation in Community Pediatrics and Advocacy you will be scheduled to attend a training program titled: *Physical Activity Interventions in Pediatric Primary Care* (PAIPPC). Please complete this brief pre-test/needs assessment to help us identify pediatric residents' physical activity intervention knowledge and skills. This pre-test/needs assessment will take approximately 20-30 minutes to complete. Please do not reference any outside resources to complete this assessment. **This pre-test and a post-test conducted at the conclusion of the training sessions are mandatory for the rotation. Please submit the completed pre-test by...**

The Instructor is also conducting a research study titled: *Development and Evaluation of a Training Program in Physical Activity Interventions for Pediatric Residents*. The purpose of this study is to examine residents' physical activity promotion knowledge, attitudes, and behaviors. Only residents in the Community Pediatrics and Advocacy rotation are eligible to participate. You may voluntarily agree to allow your pre-test and post-test responses to be used for this study by clicking "yes" on the informed consent form.

Upon submitting your responses to the online pre-test and post-test, your data will be sent to a Research Assistant who has no connection to the rotation or the PAIPPC program. The Research Assistant will remove any identifiable information (name and e-mail) from the response data before sharing it with the Instructor. Therefore, your responses and your decision over whether to provide informed consent will be confidential to the Instructor and will not impact your performance in this training program.

If you have any questions, please contact the Instructor/researchers listed below.

Kim McNally, MS, EdD candidate
PAIPPC Instructor/Researcher
Lecturing Fellow, Duke University Dept. of Health, Wellness, & PE
kmcnally@duaa.duke.edu
919-684-1109

Diane Gill, PhD
Principal Investigator
Professor, UNCG Dept. of Kinesiology
dlgill@uncg.edu

Focus Group Recruitment Letter

Hi,

During your rotation in Community Pediatrics and Advocacy you attended a training program titled: *Physical Activity Interventions in Pediatric Primary Care (PAIPPC)* which is part of a study titled: *Development and Evaluation of a Training Program in Physical Activity Interventions for Pediatric Residents*. During the second phase of this study we are conducting a focus group interview to learn more about your knowledge, attitudes, and behaviors related to physical activity interventions; and to get your impressions of the program, particularly related to the utility of the instructional strategies.

The focus group will be led by an unbiased Research Assistant who has no connection to the PAPPCC program or the Community Pediatrics/Advocacy rotation. Your responses will be anonymous to the program instructor, study investigators, and rotation staff.

For participating in the focus group you will receive a snack or meal during the session (depending on the time), a \$25 gift card, and a gift certificate for a free personal training session at Wilson Recreation Center. Gift cards are available from vendors such as Barnes & Noble, Regal movie theaters, Apple iTunes store, and several area restaurants.

If you agree to participate in this focus group, you will be e-mailed a Doodle meeting invitation to determine which dates and times accommodate all participants. You will be sent a follow-up e-mail to confirm the focus group time(s).

If you agree to participate in the physical activity interventions focus group, please click on the link below to review and electronically sign the informed consent form.

Click here to access the informed consent form

If you have any questions, please contact the Instructor/researchers listed below.

Kim McNally, MS, EdD candidate
PAPPCC Instructor/Researcher
Lecturing Fellow, Duke University Dept. of Health, Wellness, & PE
kmcnally@duaa.duke.edu
919-684-1109

Diane Gill, PhD
Principal Investigator
Professor, UNCG Dept. of Kinesiology
dlgill@uncg.edu

APPENDIX G

INFORMED CONSENT FORMS

Informed Consent Form-Pilot Study

Project Title: Development and Evaluation of a Training Program in Physical Activity Interventions for Pediatric Residents-Pilot Study

Principal Investigator/Researchers: Diane Gill, PhD, Kim McNally, MS, EdD candidate

What is the study about?

This research study will evaluate and refine a questionnaire that will be used to examine health care practitioners' knowledge, attitudes, and behaviors regarding physical activity interventions in primary care.

Why are you asking me?

You are eligible to participate in this study if you are a medical student at Duke University (identifiable in the student directory).

What will you ask me to do if I agree to be in the study?

If you consent to participate in this study you will complete an online questionnaire that examines your knowledge, attitudes, and behaviors regarding physical activity intervention and also your reactions to the wording and content of the questions. This online questionnaire will take approximately 20-30 minutes to complete.

What are the dangers to me?

The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants.

Are there any benefits to society as a result of me taking part in this research?

If you participate in the study, your responses may help researchers better understand how to train health care practitioners to provide effective physical activity interventions for their patients.

Are there any benefits to me for taking part in this research study?

There are no direct benefits to participants in this study.

Will I get paid for being in the study? Will it cost me anything?

If you consent to participate in this study and submit a completed questionnaire, you will receive a coupon via e-mail for a 25% discount off a personal training session or package at the Duke University campus recreation centers. There are no costs for you to participate in this study.

How will you keep my information confidential?

All informed consent forms and response data will be secured in a password protected online database. Only group data will be published. All information obtained in this study is strictly confidential unless disclosure is required by law. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

What if I want to leave the study?

Your participation in this study is voluntary. You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state.

What about new information/changes in the study?

If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Questions or concerns?

If you have any concerns about your rights or how you are being treated; or if you have questions, want more information or have suggestions, please contact Eric Allen in the Office of Research Compliance at UNCG toll-free at (855) 251-2351. Questions, concerns or complaints about this project or benefits or risks associated with being in this study can be answered by Dr. Diane Gill who may be contacted at dlgill@uncg.edu.

Voluntary Consent by Participant:

This form does not waive any legal rights nor release the researchers, sponsors or involved institutions from their legal and professional responsibilities. By clicking “yes” in the electronic authorization box below, you are agreeing that you have read and fully understand the contents of this document and all of your questions concerning this study have been answered. By clicking “yes” in the electronic authorization box you are also agreeing that you are 18 years of age or older and willingly consent to participate in this study.

Yes _____

No _____

Date _____

Informed Consent Form-Formal Study

Project Title: Development and Evaluation of a Training Program in Physical Activity Intervention for Pediatric Residents

Principal Investigator/Researchers: Diane Gill, PhD, Kim McNally, MS, EdD candidate

What is the study about?

This research study will examine pediatric residents' knowledge, attitudes, and behaviors regarding physical activity intervention in primary care.

Why are you asking me?

You have been identified as a potential participant for this study because you will be attending a training program titled: *Physical Activity Intervention in Pediatric Primary Care (PAIPPC)* as part of your rotation in Community Pediatrics/Advocacy.

What will you ask me to do if I agree to be in the study?

During the required PAIPPC program you will complete a mandatory online pre-test prior to the program and post-test after the program to assess resident learning needs and outcomes. These online measures will take approximately 20-30 minutes to complete. The PAIPPC program involves 3 sessions of 60-90 minutes each during which didactic, discussion-based, and active learning activities will be used to enhance your physical activity intervention knowledge and skills.

If you consent to participate in this study, you agree to allow your pre and post-test responses to be used for this study. If you do not consent to participate in this study, your responses will still be required for the PAIPPC program but they will not be used for this study.

What are the dangers to me?

The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. Your willingness to participate will not impact your performance in the PAIPPC training program or the Community Pediatrics/Advocacy rotation. Submitted consent forms and pre-test/post-test responses will only be accessible to a Research Assistant who has no connection to the rotation or study. For residents who provide positive informed consent, their responses will be assigned a participant number, de-identified (i.e., your name and e-mail will be deleted), and saved to a separate study database before being shared with the Instructor/researcher. Therefore, during the PAIPPC program, participants' responses will be anonymous and their decision whether to provide informed consent for the study will be confidential to the instructor.

Are there any benefits to society as a result of me taking part in this research?

If you participate in the study, your responses may help researchers better understand how to train physicians to provide effective physical activity intervention for their patients.

Are there any benefits to *me* for taking part in this research study?

There are no direct benefits to participants in this study.

Will I get paid for being in the study? Will it cost me anything?

There are no costs to you or payments made for participating in this study

How will you keep my information confidential?

All informed consent forms and response data will be secured in a password protected online database that is only accessible to the Research Assistant who has no connection to the Community Pediatrics/Advocacy rotation or the study. The document connecting the residents' names to their participant numbers will only be accessible to the Research Assistant who will save it as a password protected pdf file on her computer. Study data will be secured in a password protected online database that is only accessible to the Instructor and researchers. Only group data will be published. Additionally, reports will not indicate which residency rotation, year or clinic in which residents work.

All information obtained in this study is strictly confidential unless disclosure is required by law. Absolute confidentiality of data provided through the Internet cannot be guaranteed due to the limited protections of Internet access. Please be sure to close your browser when finished so no one will be able to see what you have been doing.

What if I want to leave the study?

Your participation in this study is voluntary. You have the right to refuse to participate or to withdraw at any time, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state.

What about new information/changes in the study?

If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Questions or concerns?

If you have any concerns about your rights or how you are being treated; or if you have questions, want more information or have suggestions, please contact Eric Allen in the Office of Research Compliance at UNCG toll-free at (855)-251-2351. Questions, concerns or complaints about this project or benefits or risks associated with being in this study can be answered by Dr. Diane Gill who may be contacted at dlgill@uncg.edu.

Voluntary Consent by Participant:

This form does not waive any legal rights nor release the researchers, sponsors or involved institutions from their legal and professional responsibilities. By clicking “yes” in the electronic authorization box below, you are agreeing that you have read and fully understand the contents of this document and all of your questions concerning this study have been answered. By clicking “yes” in the electronic authorization box you are also agreeing that you are 18 years of age or older and willingly consent to participate in this study.

Yes _____

No _____

Date _____

Informed Consent Form-Phase 2 Focus Group

Project Title: Development and Evaluation of a Training Program in Physical Activity Intervention for Pediatric Residents

Principal Investigator/Researchers: Diane Gill, PhD, Kim McNally, MS, EdD candidate

What is the study about?

This research study will (1) examine pediatric residents' knowledge, attitudes, and behaviors regarding physical activity intervention in primary care; and (2) assess the instructional strategies that were most effective in improving physical activity promotion, knowledge, attitudes, and behaviors.

Why are you asking me?

You have been identified as a potential participant for this study because you attended a training program titled: *Physical Activity Intervention in Pediatric Primary Care (PAIPPC)* as part of your rotation in Community Pediatrics/Advocacy.

What will you ask me to do if I agree to be in the study?

You will attend a one-hour focus group interview where you will be asked to discuss your knowledge, attitudes, and behaviors related to physical activity intervention and your impressions of the physical activity intervention training program.

What are the dangers to me?

The Institutional Review Board at the University of North Carolina at Greensboro has determined that participation in this study poses minimal risk to participants. Your willingness to participate will not impact your performance in the PAIPPC training program or the Community Pediatrics/Advocacy rotation. Consent forms and identifiable focus group responses will only be accessible to a Research Assistant who has no connection to the PAIPPC program or the Community Pediatrics/Advocacy rotation. Responses will be recorded and de-identified before being evaluated by the instructor/investigator.

Are there any benefits to society as a result of me taking part in this research?

If you participate in the study, your responses may help researchers better understand how to train physicians to provide effective physical activity intervention for their patients.

Are there any benefits to *me* for taking part in this research study?

There are no direct benefits to participants in this study.

Will I get paid for being in the study? Will it cost me anything?

There are no costs to you. You will receive a \$25 gift card (retail or restaurant) and a snack or meal for participating in the focus group.

How will you keep my information confidential?

All informed consent forms and response data will be secured in a password protected database that is only accessible to the Research Assistant who has no connection to the PAIPPC program or the Community Pediatrics/Advocacy rotation. Responses will be recorded and de-identified by

the Research Assistant before being evaluated by the instructor/investigator. Participant's de-identified responses may be quoted in publications. Additionally, reports will not indicate which residency rotation, year or clinic in which residents work. All information obtained in this study is strictly confidential unless disclosure is required by law.

What if I want to leave the study?

Your participation in this study is voluntary. You have the right to refuse to participate or to withdraw at any time before, during, or after the focus group, without penalty. If you do withdraw, it will not affect you in any way. If you choose to withdraw, you may request that any of your data which has been collected be destroyed unless it is in a de-identifiable state.

What about new information/changes in the study?

If significant new information relating to the study becomes available which may relate to your willingness to continue to participate, this information will be provided to you.

Questions or concerns?

If you have any concerns about your rights or how you are being treated; or if you have questions, want more information or have suggestions, please contact Eric Allen in the Office of Research Compliance at UNCG toll-free at (855)-251-2351. Questions, concerns or complaints about this project or benefits or risks associated with being in this study can be answered by Dr. Diane Gill who may be contacted at dlgill@uncg.edu.

Voluntary Consent by Participant:

This form does not waive any legal rights nor release the researchers, sponsors or involved institutions from their legal and professional responsibilities. By clicking "yes" in the electronic authorization box below, you are agreeing that you have read and fully understand the contents of this document and all of your questions concerning this study have been answered. By clicking "yes" in the electronic authorization box you are also agreeing that you are 18 years of age or older and willingly consent to participate in this study.

Yes _____

No _____

Name: _____

E-mail: _____

APPENDIX H
INSTITUTIONAL AUTHORIZATION



Pediatric Primary Care
Mailing Address

DUMC 3675
Durham NC 27710

To UNC Greensboro Office of Research Support:

This document serves as a letter of support for the study titled: "Development and Evaluation of a Training Program in Physical Activity Promotion for Pediatric Residents." The instructor/researcher is authorized to recruit participants and conduct data collection during delivery of the training program titled: "Physical Activity Promotion in Pediatric Primary Care." This program is part of the rotation in Community Pediatrics and Advocacy for Pediatric Residents in the Duke University Health System. If you have any questions regarding this letter of support, I can be contacted at Debra.best@duke.edu.

Regards,

A handwritten signature in black ink that reads "Debra L. Best". The signature is written in a cursive, flowing style.

Debra L. Best, MD

APPENDIX I
IRB APPROVAL



THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

OFFICE OF RESEARCH COMPLIANCE
2718 Beverly Cooper Moore and Irene Mitchell Moore
Humanities and Research Administration Bldg.
PO Box 26170
Greensboro, NC 27402-6170
336.256.1482
Web site: www.uncg.edu/orc
Federalwide Assurance (FWA) #216

To: Diane Gill
Dept of Kinesiology
250 HHP Building

From: UNCG IRB

Date: 11/01/2011

RE: Notice of IRB Exemption
Exemption Category: 2.Survey, interview, public observation
Study #: 11-0381

Study Title: Development and Evaluation of a Training Program in Physical Activity Promotion for Pediatric Results

This submission has been reviewed by the above IRB and was determined to be exempt from further review according to the regulatory category cited above under 45 CFR 46.101(b).

Study Description:

The purpose of this project is to develop, implement and evaluate a training program titled Physical Activity Promotion in Pediatric Primary Care for pediatric residents.

Investigator's Responsibilities

Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented. The IRB will maintain records for this study for three years from the date of the original determination of exempt status.

CC:
Kimberly McNally
, (ORC), Non-IRB Review Contact



THE UNIVERSITY of NORTH CAROLINA
GREENSBORO

OFFICE OF RESEARCH COMPLIANCE
2718 Beverly Cooper Moore and Irene Mitchell Moore
Humanities and Research Administration Bldg.
PO Box 26170
Greensboro, NC 27402-6170
336.256.1482
Web site: www.uncg.edu/orc
Federalwide Assurance (FWA) #216

To: Diane Gill
Dept Of Kinesiology
250 HHP Building

From: UNCG IRB

Date: 5/07/2012

RE: Notice of IRB Exemption
Exemption Category:
Study #: 11-0381

Study Title: Development and Evaluation of a Training Program in Physical Activity Promotion for Pediatric Results

This submission has been reviewed by the above IRB and was determined to be exempt from further review according to the regulatory category cited above under 45 CFR 46.101(b).

Study Description:

The purpose of this project is to develop, implement and evaluate a training program titled Physical Activity Promotion in Pediatric Primary Care for pediatric residents.

Study Specific Details:

This modification includes

Addition of focus group

Change in consent adding focus group

Investigator's Responsibilities

Please be aware that any changes to your protocol must be reviewed by the IRB prior to being implemented. The IRB will maintain records for this study for three years from the date of the original determination of exempt status.

CC:
Kimberly McNally
ORC, (ORC), Non-IRB Review Contact



Hi Kim,

I am writing to follow-up on your application to the Duke IRB to conduct the above-named project. We will accept the UNCG IRB's approval of your protocol and do not see the need to conduct our own review. Thus, you are free to launch your project. Feel free to contact me if you have questions.

Best,

Holly Williams

Specialist

IRB the Protection of Human Subjects in Non-medical Research