

PEDAGOGY

Using a 3-Day Physical Activity Recall as Homework to Increase Physical Activity in Rural Appalachian School Youth: A 3-Week Pilot Intervention Program

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Abstract

The purpose of this study was to examine the effect of a 3-Day Physical Activity Recall (3DPAR) intervention program on the physical activity (PA) levels of rural Appalachian school youth. To the best of our knowledge, this is the first study in which the pre- and postlevel of PA in rural Appalachian school youth has been assessed following a 3DPAR intervention program. A sample of 76 school youth ($M_{age} = 13.3$ years) recruited from three secondary schools in the Appalachian region was included in the final analyses. To assess intervention effects such as steps per day and moderate to vigorous PA (MVPA) minutes per day, we had participants wear sealed NL-1000 piezoelectric pedometers for 7 days at pre- and posttest. For this 3-week pilot intervention, participants recorded daily activity using a 3DPAR self-report instrument. Participants received two educational sessions during the first three classes of the intervention period. We utilized a MANOVA to determine the effects of intervention participation on pre- versus posttest for the whole week, weekdays, and weekends. Youth who completed the 3DPAR-delivered intervention significantly increased their step counts on the weekends. Future studies should evaluate whether a longer intervention including a control group could result in improving PA over the long term.

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Background

Substantial health benefits of regularly participating in physical activity (PA) in daily life and quality physical education (PE) classes have been well documented (Institute of Medicine [IOM], 2013; U.S. Department of Health and Human Services [USDHHS], 2008). The current PA guidelines for youth aged 6 to 17 years recommend at least 60 min/day of moderate intensity activity (Strong et al., 2005; USDHHS, 2008); however, many youth do not meet the recommended PA guidelines (Troiano et al., 2008). For example, only 34.7% of youth in Grades 9 to 12 meet the current PA guidelines (Centers for Disease Control and Prevention [CDC], 2010).

Underrepresented youth are typically inactive (Oh & Rana, 2014; Sutherland et al., 2015). Appalachia is one of the poorest and most medically challenged regions in America (Behringer & Friedell, 2006). Appalachian regions have the highest level of mortality rates, obesity, and inactivity in America (Borak, Salipante-Zaidel, Slade, & Fields, 2012; Gregg et al., 2009; Wewers et al., 2000). The most recent data show that school youth living in the southeastern region of Appalachia are insufficiently active (Oh & Rana, 2014). In addition, only 5% of rural Appalachian adolescents meet the recommended 60 min/day of PA time (Hortz, Stevens, Holden, & Petosa, 2009).

Various interventions have been used to increase PA in diverse settings and with diverse population groups. The informational approach to improve PA has been promising; in this approach, the individuals are provided with specific PA and exercise information related to making informed decisions about healthful lifestyles (Kahn et al., 2002). Pedometer-based interventions targeted to promote PA in students have been introduced (Hart, Brusseau, Kulinna, McClain, & Tudor-Locke, 2011; Lubans, Morgan, Callister, & Collins, 2009; Raedeke, Focht, & King, 2013; Shimon & Petlichkoff, 2009; Zizzi et al., 2006). One study incorporated eHealth technology along with self-monitoring strategies into a pedometer-based intervention, and youth showed higher step counts after the intervention (Lubans et al., 2009). However, strategies and interventions using the 3DPAR instrument with the intention to promote awareness and knowledge of current PA guidelines for school youth in rural Appalachian regions have not been studied. Simple, practical, and

inexpensive PA intervention strategies are especially critical in these rural areas.

A quality PE class in school is a focal place to educate students to be physically literate people who demonstrate the knowledge and skills to sustain and improve a health-enhancing PA level (National Association for Sport and Physical Education [NASPE], 2013; Slater, Nicholson, Chriqui, Turner, & Chaloupka, 2012). With more than 95% of youth enrolled in U.S. schools (National Center for Education Statistics [NCES], 2001), it would seem profitable that physical educators teach students to make informed decisions about their activity and lifestyles (IOM, 2013).

Implementing an effective intervention to increase PA among school youth using an educational basis such as school has been promising in the literature. Therefore, the purpose of this study was to examine the effects of a 3-Day Physical Activity Recall (3DPAR) intervention program on the PA levels of rural Appalachian school youth. The 3DPAR self-report instrument has been validated in school-aged youth and found to be appropriate for school-based studies, yielding a valid reflection of usual daily PA (Pate, Ross, Dowda, Trost, & Sirard, 2003; Trost, Ward, McGraw, & Pate, 1999; Weston, Petosa, & Pate, 1997). To the best of our knowledge, this is the first study in which the pre- and postlevel of PA in rural Appalachian school youth have been assessed following a 3DPAR intervention program during which the 3DPAR instrument was utilized as homework. Specifically, we hypothesized that participants who completed the 3DPAR homework during a 3-week intervention program (completers) would demonstrate higher levels of PA as measured by pedometer step counts and activity time than those who did not complete the 3DPAR homework during the intervention program (noncompleters). The completers of this intervention completed all the pedometer data collection, attended two educational sessions, and completed 3DPAR on a weekly basis, whereas noncompleters completed all the pedometer data collection and attended two educational sessions, but they did not complete the 3DPAR over the 3-week intervention.

Method

Study Design

The university institutional review board approved the study protocol. Parents of participants 11 to 17 years old and participants 18 years old or older signed a consent form to participate in this study. Data sources for this study included a demographic questionnaire, student engagement in PA as measured through pedometers, and self-reported engagement in daily PA as measured by the 3DPA self-report instrument.

The data collected for this study were confidential and used only for data collection purposes. Prior to the start of the study, the research team completed training required by the institutional review board and the primary investigator presented the team with an overview of the study protocol.

Based on a previous study (Oh & Rana, 2014), this pilot intervention was designed to improve PA levels of rural Appalachian youth. We used the nonprobability sampling method to select participating schools in the southeastern area of rural Appalachia. We collected data at one high school and two middle schools in regularly scheduled PE classes of three PE teachers. The region of Appalachia where we conducted our intervention is economically disadvantaged (Oh & Rana, 2014); also refer to Table 1.

Table 1

Descriptive Characteristics by Completion of the Intervention

Variable	Completed intervention (<i>n</i> = 41) <i>M</i> ± <i>SD</i> or <i>n</i> (%)	Did not complete intervention (<i>n</i> = 35) <i>M</i> ± <i>SD</i> or <i>n</i> (%)
Age (year)	13.2 ± 1.3	13.5 ± 1.8
Weight (kg)		
Girls	61.0 ± 24.4	74.6 ± 23.1
Boys	59.9 ± 12.9	58.0 ± 21.9
Height (cm)		
Girls	159.5 ± 10.3	160.5 ± 7.1
Boys	162.3 ± 10.2	161.2 ± 13.3

Table 1 (cont.)

Variable	Completed intervention (<i>n</i> = 41) <i>M</i> ± <i>SD</i> or <i>n</i> (%)	Did not complete intervention (<i>n</i> = 35) <i>M</i> ± <i>SD</i> or <i>n</i> (%)
Gender		
Girls	17 (41.5%)	16 (45.7%)
Boys	24 (58.5%)	19 (54.3%)
Parental Education		
< High school	2 (4.9%)	3 (8.6%)
High school	16 (39.0%)	16 (45.7%)
Some college/2-year college	13 (31.7%)	9 (25.7%)
4-year college	4 (9.8%)	5 (14.3%)
Some graduate school	2 (4.9%)	1 (2.9%)
Professional/doctorate	2 (4.9%)	1 (2.9%)
Did not answer	2 (4.9%)	0 (0%)
Household income		
< \$15,000	9 (22.0%)	5 (14.3%)
\$15,000–\$25,000	7 (17.1%)	8 (22.9%)
\$26,000–\$35,000	4 (9.8%)	4 (11.4%)
\$36,000–\$45,000	2 (4.9%)	3 (8.6%)
\$46,000–\$55,000	1 (2.4%)	4 (11.4%)
\$56,000–\$65,000	1 (2.4%)	1 (2.9%)
> \$66,000	5 (12.2%)	3 (8.6%)
Prefer not to answer	10 (24.4%)	5 (14.3%)
Did not answer	2 (4.9%)	2 (5.7%)

It took 6 weeks to complete this intervention study at each school, including study explanation (first week), preintervention data collection (second week), intervention (third, fourth, and fifth weeks), and postintervention data collection (sixth week). The participants received two educational sessions during the first three classes of the 3-week pilot intervention. Overall, this study occurred over 10 months in that it was implemented one school at a time. The study

did not alter participating schools' PE curriculum and grading policy, except for the educational sessions.

Participants

All students in Grades 6 to 12 in the three participating schools located in the southeastern area of rural Appalachia were given an opportunity to participate in this study. The PE teachers in these schools supported the implementation of this study, specifically the use of the 3DPAR self-report instrument and pedometers during the intervention phase of the study. Students in the participating schools received 45 min of PE daily in a coeducational setting.

Instruments

Demographic questionnaire. Parents of the 11- to 17-year-old participants and participants 18 years or older completed a demographic survey, reporting age, grade level, gender, and parents' annual income and educational attainment. Participants were not included if they were physically ill, took medications that could affect their regular PA participation, or had any injury that required daily activity restrictions.

Pedometers. New Lifestyles NL-1000 pedometers (New Lifestyles Inc., Lees Summit, MO) were used to measure student PA levels during the intervention phase of the study. Researchers have found these pedometers to be valid and reliable when used with youth (Hart et al., 2011); the NL-1000 employs a piezoelectric accelerometer mechanism that can automatically record step counts for up to 7 days and moderate to vigorous PA (MVPA) time in 1-day epochs. Unlike traditional spring-levered pedometers, piezoelectric pedometers have been found to count steps within $\pm 3\%$ actual steps accumulated, 95% of the time, regardless of weight status (Schneider, Crouter, Lukajic, & Bassett, 2003). Piezoelectric pedometers are also more accurate than traditional spring-levered pedometers for overweight and obese people who move at slower walking speeds (Crouter, Schneider, & Bassett, 2005).

Prior to data collection, we changed each NL-1000 pedometer battery used for this study and performed a series of shake tests to check for defects. Participants wore the sealed NL-1000 piezoelectric pedometers for 7 consecutive days pre- and postintervention to prevent the possibility of data loss. We collected the pedometer data

for 7 consecutive days and used these as a baseline measure of PA. We taught students how to wear the sealed New Lifestyles NL-1000 pedometer and asked them to wear the pedometer on the right side of their belt or their waistband at the midline of the thigh all day for 7 days except while sleeping and during any water-based activities. In a PA log, the participants recorded the time that they put on and took off the pedometer.

Upon completion of the pre- and posttest, we recorded the participants' number of step counts and MVPA time (i.e., average step counts per day and average MVPA minutes per day) in a computer. To be included in the analysis, participants must have had at least 2 weekdays and 1 weekend day of valid pre- and postintervention data, as suggested by Rowe, Mahar, Raedeke, and Lore (2004; $\geq 1,000$ & $\leq 30,000$ step counts/day); we also used Colley, Janssen, and Tremblay's (2012) 12,000 daily step recommendation to determine whether participants in this intervention study met these pedometer guidelines. The primary focus of this study was to determine the sole effectiveness of the intervention; therefore, we did not provide pre-pedometer information to the participants. However, we provided pedometer step information after the posttest to those who completed the intervention.

Intervention educational sessions. The principal investigator developed the topics and materials for the two sessions using the 3DPAR self-report instrument (Troost, Ward, McGraw, & Pate, 1999; Weston, Petosa, & Pate, 1997) and the PA guidelines for youth available at the CDC website (2012). Accordingly, based on the developed materials, the PE teachers and research team members presented the following information to the students during PE class: (a) currently recommended daily PA guidelines for youth (e.g., intensity, duration, frequency, and type of PA), (b) health effects of PA, (c) strategies to improve students' current PA level, and (d) how to monitor their PA levels using the 3DPAR self-report instrument (Pate et al., 2003; Troost et al., 1999; Weston et al., 1997).

The 3DPAR self-report instrument. For the 3-week intervention program, participants recorded daily activity using the 3DPAR self-report instrument. The 3DPAR self-report instrument has been validated in school-aged youth and found to be appropriate for school-based studies, yielding a valid reflection of usual daily PA (Pate et al., 2003; Troost et al., 1999; Weston et al., 1997). Fifty-nine

common activities, each of which corresponds to a number with photos explaining duration, intensity, and type of PA that would contribute to the recommended guidelines for PA, are included in the 3DPAR instrument.

In this study, we used the 3DPAR instrument as homework to teach the participants about the current recommendations for daily PA and how to monitor their daily PA levels. For homework, the students were simply required to record the PA that they performed each day; there was no mandate that a student increase PA amounts for homework credit. We assessed the students' 3DPAR reports as complete or not complete for each week of the 3-week intervention and shared the results with the three PE teachers. The PE homework was not graded, because this study was not designed to modify the PE curriculum and grading policy of the schools involved nor to force any participants to complete the intervention to get a good grade.

We anticipated that the daily recording of PA using the 3DPAR self-report instrument would motivate those performing little PA to do more and those already doing considerable PA to maintain. To be included in the analysis, participants had to complete at least 2 week-days and 1 weekend of 3DPAR, as suggested by Pate et al. (2003). Students submitted their completed 3DPAR every Monday during the intervention. All students in the three participating schools completed the 3DPAR during the intervention. However, only those who submitted the parental consent and youth assent forms were included in the final analyses.

Data Collection Procedure

Preintervention. After receiving permission from school personnel to conduct this study, we visited the schools to introduce the students to the importance of the study and administer the demographic questionnaire to the students in the selected PE classes. Then we collected PA baseline data using pedometers with an MVPA timer. During the pre- and posttest, trained members of the research team were present at all times during baseline PA data collection to ensure participants wore the pedometers correctly and to answer questions when needed.

During the intervention. After obtaining baseline PA data, we implemented the intervention for 3 weeks. The students received two educational sessions during the first three classes of the inter-

vention. Participants in this study completed the 3DPAR self-report instrument every day for the week including weekdays and weekends and returned it to their PE teachers every Monday during the intervention. We recorded the 3DPAR as complete or not complete and reported this information to the PE teachers on a weekly basis. PE teachers then shared the weekly results of the 3DPAR with their students and encouraged them to complete their 3DPAR. During the 3-week intervention program, at least one trained member of the research team was present at all times during each lesson to answer questions pertaining to the 3DPAR when needed.

Postintervention. After the 3-week intervention program, the students wore the same pedometers for 7 consecutive days, as was done preintervention. Trained members of the research team were present during postintervention PA data collection to ensure the participants wore the pedometers correctly and to answer questions when needed.

Data Analysis

We performed all statistical analyses using PASW Statistics (Version 18.0, Chicago, IL). We used an alpha level of 0.05 for all statistical analyses. The independent variable was completion of the 3DPAR homework or not, creating two groups (completers vs. noncompleters). The dependent variables included average steps per day and MVPA minutes per day for the whole week (7D), weekdays (5D), and weekends (2D). We calculated descriptive data as frequencies and reported them as percentages (see Table 1). Due to multicollinearity of the variables, we used a mixed-factor multivariate analysis of variance (MANOVA) to determine the effects of intervention participation on pre- versus postintervention PA (average steps per day and MVPA minutes per day) for 7D, 5D, and 2D. If we found a significant interaction, we used paired *t* tests (for pre- vs. postintervention in each group) and independent *t* tests (to compare the two groups pre- and postintervention) to decompose the interaction. We did not detect a sphericity violation ($\epsilon = 1.000$).

Results

Table 1 presents the values for demographic and anthropometric data of the participants. Initially, 160 participants signed up for the study. Approximately 47.5% ($N = 76$) of the participants completed

all of the pedometer pre- and post-data collection and were used for the final study analyses. Of these 76 participants, 41 completed the homework intervention (completers; $M_{\text{age}} = 13.2 \pm 1.3$ years) and 35 did not (noncompleters; $M_{\text{age}} = 13.5 \pm 1.8$ years). Of the completers, 24 were boys ($M_{\text{weight}} = 59.9 \pm 12.9$ kg, $M_{\text{height}} = 162.3 \pm 10.2$ cm) and 17 were girls ($M_{\text{weight}} = 61.0 \pm 24.4$ kg, $M_{\text{height}} = 159.5 \pm 10.3$ cm). Of the noncompleters, 19 were boys ($M_{\text{weight}} = 58.0 \pm 21.9$ kg, $M_{\text{height}} = 161.2 \pm 13.3$ cm) and 16 were girls ($M_{\text{weight}} = 74.6 \pm 23.1$ kg; $M_{\text{height}} = 160.5 \pm 7.1$ cm).

Average Pedometer Step Counts per Day

Table 2 shows the average step counts per day and MVPA minutes per day for completers and noncompleters during pre- and postintervention. There were no significant interactions for 7D or 5D average steps per day ($p > 0.05$) and no significant main effects for 7D or 5D average steps per day ($p > 0.05$). However, there was a significant interaction ($F = 4.595$, $p = 0.035$, partial $\eta^2 = 0.058$) for 2D average steps per day. When running post hoc tests on this interaction, we found that the group that completed the intervention significantly improved ($t = -3.24$, $p = 0.002$, percent change = 39.34%) their average step count by 2,303 steps from pre- to postintervention on the weekends, whereas the group that did not complete the intervention did not have a significant difference in step counts on the weekends ($t = -0.324$, $p = 0.748$, percent change = 3.55%), improving their average step count by only 210.6 steps. There was no significant difference, however, between the groups for either pre- (85.5 steps/day difference, $t = -0.106$, $p = 0.916$, ES = 0.022) or postintervention (2,007.0 steps/day difference, $t = 1.941$, $p = 0.056$, ES = 0.483) in average steps per day on the weekends, although the postintervention difference had a moderate effect size. Based on the 7D pedometer step counts, approximately 14.6% ($n = 6$) of those who completed the intervention met the daily step recommendation of 12,000 steps (Colley et al., 2012) compared with only 8.6% ($n = 3$) of those who did not complete the intervention.

Table 2

Average Steps per Day and MVPA Minutes per Day Differences by Time and Completion of Intervention

Variable	Preintervention (<i>n</i> = 76)		Postintervention (<i>n</i> = 76)	
	Complete (<i>n</i> = 41)	Not complete (<i>n</i> = 35)	Complete (<i>n</i> = 41)	Not complete (<i>n</i> = 35)
	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>	<i>M</i> ± <i>SD</i>
5D steps/day	8812.5 ± 2821.9	8389.6 ± 2199.2	8763.4 ± 2949.7	8114.2 ± 2401.9
5D MVPA (min/day)	27.3 ± 12.3	24.8 ± 9.8	26.8 ± 12.5	24.5 ± 11.7
2D steps/day*	5853.7 ± 3055.9	5939.26 ± 3964.7	8156.8 ± 4761.7**	6149.8 ± 4155.1
2D MVPA (min/day)**	12.2 ± 9.7	13.0 ± 11.8	22.1 ± 19.0	16.1 ± 15.0
7D steps/day	8112.6 ± 2603.4	7848.3 ± 2328.3	8614.3 ± 2973.5	7570.4 ± 2340.4
7D MVPA (min/day)**	23.4 ± 11.3	22.2 ± 9.0	26.3 ± 12.0	23.8 ± 11.1

Note. MVPA = moderate to vigorous physical activity; 5D = weekdays; 2D = weekend days; 7D = all days of week.

*Significant interaction ($p = 0.035$).

**Significant difference pre- to postintervention in the group completing the intervention ($p = 0.002$).

***Significant main effect for time (pre- to postintervention is significantly different; $p < 0.001$ for 2D MVPA; $p = 0.019$ for 7D MVPA).

Average MVPA minutes per day. There were no significant interactions for 7D, 5D, or 2D ($p > 0.05$) average MVPA minutes. For 7D MVPA, there was a significant main effect ($F = 5.752, p = 0.019$, partial $\eta^2 = 0.072$) from pre- to postintervention with no main effect ($p > 0.05$) between groups; overall, the participants, regardless of completing the intervention, improved their MVPA from 22.8 to 25.0 min/day. For 5D MVPA, there was no significant main effect ($p > 0.05$). For 2D MVPA, there was a significant main effect ($F = 14.100, p < 0.001$, partial $\eta^2 = 0.160$) from pre- to postintervention with no main effect ($p > 0.05$) between groups; overall, the participants, regardless of completing the intervention, improved their MVPA minutes from 12.6 to 19.1 min/day on the weekends. Based on the 7D MVPA time, none of the participants met the recommended daily PA guidelines (i.e., 60 min/day of moderate intensity activity).

Discussion

The purpose of this study was to examine the effects of a 3DPA intervention program on the PA levels of rural Appalachian school youth. To the best of our knowledge, this is the first study in which the pre- and postlevel of PA in rural Appalachian school youth has been assessed following a 3DPA intervention program during which the 3DPA instrument was utilized as PE homework. This study partially observed the effectiveness of a 3DPA-delivered intervention to increase PA among rural Appalachian school youth. The intervention completers demonstrated significant step increases on weekends from an average of 5,853 to 8,156. Also, MVPA minutes per day increased on weekends from an average of 12.2 to 22.1 min/day for all participants. Regardless of whether participants completed the intervention, it should be mentioned that this is still far below recommendations of step counts per day and MVPA minutes per day. No further intervention effects of this study were observed. Approximately 14.6% of those who completed the intervention met the daily step recommendation of 12,000 steps compared to 8.6% of noncompleters at postintervention. The percentage of intervention completers meeting the daily step recommendation on weekends from pre- to posttest increased from 4.9% to 24.4%.

The results of this study partially support the hypothesis that intervention completers would demonstrate increased step counts

per day after the intervention. This partial intervention effect most likely had practical meaning even without statistical significance. An extra 2,000 steps is equal to walking 1 mile for most people; according to Hoeger, Bond, Ransdell, Shimon, and Merugu (2008), the average number of pedometer step counts to walk 1 mile ranges from 1,732 (men) to 2,371 (women) steps. If there is a 2,000 steps/day difference, that is almost equivalent to 1 extra mile of walking in a day for the intervention group of this study, which is approximately 16% of the daily step recommendation for youth (Colley et al., 2012).

Unfortunately, no previous intervention studies have been conducted to report the effectiveness of the 3DPAR instrument on school youth's PA levels. Lubans et al. (2009) incorporated interactive seminars on setting and monitoring PA goals into a pedometer-based intervention study for youth and reported significantly increased pedometer steps; boys and girls increased 1,000 and 2,000 steps/day, respectively. In the same study, participants attended seminars and were regularly provided feedback via e-mail messages during the intervention.

Studies using cognitive behavioral modification strategies appear to be important to promoting healthy and active lifestyles. The significant findings of this study are consistent with the findings in previous studies (Raedeke et al., 2010; Shimon & Petlichkoff, 2009). For instance, Simon and Petlichkoff (2009) reported that students who were able to monitor and report PA levels maintained their higher pedometer step counts during a 4-week intervention than those who were not. Participants in similar pedometer-based interventions with behavioral modification strategies also increased pedometer step counts (Croteau, 2004; Raedeke et al., 2010; Wyatt et al., 2004).

In contrast, Zizzi et al. (2006) found no intervention effects when using a quasi-experimental research design to assess pedometer step counts of high school students for 3 weeks. The high school student participants, who were randomly assigned to a goal setting or no goal setting group, did not increase pedometer step counts over the 3 weeks observed. Zizzi et al. reported that unexpected factors such as environmental barriers (e.g., unwalkable environment in rural areas and weather conditions) negatively affected their intervention study.

This study was designed based on the informational approach. This informational approach focuses on helping individuals under-

stand the cognitive behavioral skills perceived to precede health behavior (Kahn et al., 2002). Information provided to the participants in this study was primarily educational in nature and was provided to increase their knowledge of PA benefits, increase their awareness of available opportunities to be physically active within their community, explain methods for them to overcome perceived negative barriers to engage in PA, and increase their PA participation in community-based activities (Kahn et al., 2002). We cautiously conclude that observed pedometer step differences on weekends may be, in part, due to the use of the informational approach (Kahn et al., 2002) and use of a 3DPAR self-report instrument (homework) to which the participants were exposed during the intervention.

Observed step differences in this context could be also be attributed to physically active and motivated students who wanted to improve their baseline pedometer data after completing the intervention. Research evidence shows that the use of cognitive behavioral strategies to improve PA is positively associated with improved PA (Raedeke et al., 2010). Raedeke et al. (2010) reported that simply wearing a pedometer and keeping a log were not adequate to improve PA; however, when Raedeke et al. coupled this method with a cognitive behavioral skills training program, participants reported increased step counts.

Overall, the participants in this study demonstrated a low level of PA regardless of whether they completed the intervention. A possible explanation for this might be associated with environmental factors (e.g., unwalkable environment in rural areas and weather conditions), as reported by Zizzi et al. (2006). The low level of PA could be attributed to the time of year during which the study was conducted; data collection for two of the participating schools occurred during the winter months. However, in this study, it is not clear to what extent the intervention was effective. It was beyond the scope of this intervention to determine the factors relating to the increased pedometer step counts during weekends. Therefore, follow-up studies need to be conducted to confirm the findings of this study.

Regularly scheduled PE provides students with opportunities to learn motor and lifetime PA skills (IOM, 2013; USDHHS, 2008). Because more than 95% of American youth are enrolled in schools (NCES, 2001), physical educators should consider teaching stu-

dents to make informed decisions about their activity and lifestyles. Youth in low-income families were less likely to participate in organized sports because of, in part, financial matters (e.g., fees for participation and other equipment; Lutfiyya, Garcia, Dankwa, Young, & Lipsky, 2008; Snethen, Hewitt, & Petering, 2007). The region of Appalachia where the present intervention was conducted is economically disadvantaged (Oh & Rana, 2014); also refer to Table 1. For many of the rural Appalachian youth, school PE may be the only place where they learn motor and lifetime PA skills and participate in organized and supervised PA. Therefore, it is important that schools provide an adequate amount of PE time. According to a recent report, 44% of public school administrators in the United States have cut considerable time from PE and recess to increase core academic achievements responding to the No Child Left Behind mandate (IOM, 2013). PE should not be an option but central to the total school curriculum (Kelder, Karp, Scraggs, & Brown, 2014), because quality PE is foundational for lifelong health and learning active lifestyles (IOM, 2013). Unfortunately, where the present intervention was conducted only 23.3% of high school youth attend daily PE, which is lower than the national data of 31% (CDC, 2012). It has been reported that students in public schools could receive at least a minimum amount of daily MVPA if PE is a mandated part of the total school curriculum (IOM, 2013; Le Masurier & Corbin, 2006). Results from studies confirm that students are more likely to be physically active when PE is scheduled on a school day than when it is not (Brusseu & Kulinna, 2015; Morgan, Beighle, & Pangrazi, 2007). The findings of this study suggest that utilizing the 3DPAR self-report instrument, introduced during PE class, may be beneficial for students to make informed decisions about their active lifestyles outside of school.

This study has several limitations. The students who participated in this study were from one area and from three schools that were not randomly selected. This limits the generalizability of the findings of this study. Although the three participating schools represent rural Appalachian regions, a major limitation of this intervention study was a small sample of individuals from only one high school and two middle schools, which limited our ability to generalize the findings.

Although those who completed the intervention reported some increased step counts and MVPA time on weekends, students' participation rates in this study require some attention in future studies. Approximately 48% of our participants completed the intervention. Dropout occurred because of incomplete PA data collection, school absences, snow days, participants not completing proper forms, and the homework not affecting the final grade.

Despite the identified limitations of this study, it is unique to the current body of literature because no other researchers have attempted to promote student awareness and knowledge of current PA guidelines by using a valid 3DPA self-report as PE homework. This 3-week pilot intervention study includes some practical applications, for instance, the use of an informational approach and an inexpensive 3DPA self-report instrument to teach students about the importance of being physically active. The intervention was partially associated with an improved likelihood of increasing step counts and MVPA time. Although we used data from those who completed 2 weekdays and 1 weekend of 3DPA as suggested by Pate et al. (2003), to minimize dropout rates during the intervention we encouraged students to complete as many days of 3DPA as possible. In addition, we found that completing a 3DPA was difficult for some students on a weekly basis during the intervention, suggesting that students will more likely obtain intervention effects if they are required to complete the 3DPA self-report instrument as suggested by Pate et al. (2003), such as only 2 weekdays (Monday and Tuesday) and one weekend (Sunday). In addition, the effectiveness of a 3DPA-delivered intervention to improve PA levels among rural Appalachian school youth could be determined by including a control group.

This study is unique, representing a collaboration with three local schools and one university in the region of Appalachia. The state board of education adopted the NASPE standards in 2007 and benchmarks and indicators in 2009 (Ohio Department of Education [ODE], n.d.). Since the 2012–2013 academic year, all schools in Ohio have been required to report student success in meeting the benchmarks contained in the Physical Education Academic Content Standards (ODE, 2015). All students in the three participating schools were included in the study, and except for a pedometer activ-

ity, students who did not submit the required forms for this study also received two educational sessions and completed a 3DPA self-report instrument on a weekly basis as their PE homework. We then provided the PA data obtained from this study to the three PE teachers for report purposes to the ODE. We have successfully created new partnerships with local schools through the current intervention, which suggests that future studies could benefit from creating mutual ways to enhance the promotion of PA efforts among school youth, especially those living in rural areas.

In conclusion, we found that using a 3DPA-delivered intervention over 3 weeks was partially associated with increasing step counts and MVPA time. A follow-up study with more participants is required to confirm the findings of this study. Specifically, factors relating to increased step counts and MVPA time on weekends need to be further studied with a mixed methods research design to obtain a better understanding of the extent of the effectiveness of the intervention. Future studies also need to evaluate whether a longer intervention including a control group could result in improving PA over the long term; for example, future studies should offer students incentives for completing the homework, to help them be more accountable.

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