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PHYSICAL ACTIVITY

Children's Activity Levels and Lesson Context During Summer Swim Instruction

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Abstract

Summer swim programs provide a unique opportunity to engage children in PA as well as an important life-saving skill. Offering summer swim programs is critical, especially for minority populations who tend to have higher rates of drowning, specifically in youth populations. The purpose of this study was to determine the lesson context and children's participation levels during a summer swimming program taught by two experienced PE teachers. The participants in this study were two experienced PE teachers and 45 children who were enrolled in the summer swim program. Data were collected using the System for Observing Fitness Instruction Time (SOFIT) and analyzed using MANOVA and ANOVA statistical tests. Results indicated that the students overall MVPA levels during the swim program were very high (58.96 %). Results also indicated that a majority of the lesson context was spent in skill practice (47.31%), and management (20.23%) was the lowest. These findings provide additional indications that swim instruction is a viable option to provide children with ample MVPA. It would be beneficial moving forward for schools to include swim instruction in the curriculum not only to improve water safety, but also to provide high levels of PA.

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Summer swim programs provide a unique opportunity to engage children in physical activity (PA) as well as a life-saving skill. An estimated 1 in 5 people who die from drowning are children 14 and younger, and the rate of fatally drowning among African Americans is significantly higher among children 5–14 years old and almost triple the rate of White children (Laosee, Gilchrist, & Rudd, 2012). Providing minorities with opportunities to take part in swim programs is crucial because it increases individuals' swimming ability, further lessening their chance of drowning, and incorporates a health-enhancing skill high in moderate to vigorous physical activity (MVPA). Other benefits from swimming include improvements in body composition, muscular and skeletal improvements, and an increase in overall flexibility, as well as enhanced overall circulatory function (Maglischo & Brennan, 1985; Lees, 2007). In addition, swimming directly benefits children psychologically through improving overall self-image and reducing stress levels.

Although swimming is considered to be an activity that provides students with higher amounts of MVPA, one difficulty is how to measure students' activity levels. This is due to the ineffectiveness of typical instruments such as pedometers or accelerometers in the water. There is a lack of research examining PA levels of children involved in swimming programs within the physical education (PE) setting (Schwamberger & Wahl-Alexander, 2016). Warburton and Woods (1996) assessed levels of MVPA in elementary students involved in swimming lessons and found that students were actively engaged in MVPA only 9% of instructional time. Additionally, Cardon, Verstraete, De Clercq, and Bourdeaudhuij (2004) compared students' MVPA levels during swimming and nonswimming elementary PE classes. Results indicated that students' MVPA was higher in the swimming class compared to the nonswimming class, further signifying the overall benefits swimming can provide to children. However, further research examining swimming levels in PE and in other contexts outside of PE is needed.

The System for Observing Fitness Instruction Time (SOFIT) is a direct observational instrument used to assess time spent at various PA levels and lesson context and is recognized as a valid research instrument for assessing student PA levels as well as the contexts of a lesson (McKenzie et al., 1995; McKenzie, Sallis, & Nader, 1991; Pope,

Coleman, Gonzalez, Barron, & Heath, 2002). To date, several researchers have assessed student activity level using SOFIT. Recently, Smith, Lounsbery, and McKenzie (2014) assessed high school PE classes to compare PA levels and lesson contexts of boys only, girls only, and coed PE classes. They found that the quality of PE that students received was dependent on the overall gender makeup of the class. Females were shown to be significantly less active than their male counterparts regardless of the gender makeup in the class (Smith et al., 2014).

Researchers have suggested that SOFIT is appropriate in determining activity levels for children during swim instruction (McKenzie et al., 1995; McKenzie et al., 1991; Pope et al., 2002), and Cardon et al. (2004) validated this assumption. These researchers validated SOFIT for use in water through randomized testing of children's registered heart rates while in the water, compared to the five SOFIT activity levels (i.e., lying down, sitting, standing, walking, and being active). Following their study, Cardon et al. noted that SOFIT is an appropriate instrument to "register physical activity levels during swimming classes" (p. 259).

Although researchers have previously deemed SOFIT appropriate to use in this context, few have examined MVPA of swim instruction. In the Cardon et al. (2004) study, the researchers coded student activity level according to body position and movement while in and out of the water. Results from the study indicated that PA levels within the PE swimming groups were higher than those within the PE nonswimming groups. Specifically, students in the swimming groups were involved in MVPA 52% of the lessons compared to only 40% for the nonswimming lessons.

Swim instruction has been shown to provide high levels of MVPA when delivered by experienced instructors in the PE setting. However, to date, there has been a lack of research focusing on the use of SOFIT to determine MVPA levels in contexts outside the traditional PE setting. With exceptionally high drowning rates among African American children, providing developmentally appropriate swim instruction to this population seems dually beneficial. Therefore, the purpose of this study was to determine the lesson context and children's participation levels during a summer swimming program taught by two experienced PE teachers.

Method

Participants and Setting

The participants in this study were 45 fourth and fifth grade children with an average age of 9.81 (28 boys, 17 girls). All children were selected to participate in this study because of their enrollment in a summer swimming program at a local YMCA in a low-income community.

Two experienced PE teachers who were enrolled in a master's program at a large public university in the Southeastern United States also participated in this study. Both teachers were female, Caucasian, and in their 20s. These teachers were selected because they were WSI-certified swim instructors with over 3 years of experience teaching this content. Written informed consent and assent were obtained from each child, the child's guardian, and both instructors. The university human subjects committee approved the study.

The swimming program consisted of 16 lessons led by the two participants who were experienced WSI swim instructors. All lessons transpired at a local swimming pool, which was within walking distance from the local YMCA. This pool was conducive to providing developmentally appropriate swim instruction because it was shallow along the edges and large enough for groups to be spaced out accordingly. The duration of each lesson was 50 min, with 10 min allocated for changing out of their swimming attire following instruction. During every lesson, the children were grouped according to ability level, and they received instruction from the same teacher throughout the program.

Systematic Observation Instrument

Lessons were videotaped and coded with SOFIT (McKenzie et al, 1991). SOFIT uses momentary time sampling (10-s observe, 10-s record), to quantify key elements of the lesson objectively, including student activity levels and teacher behaviors, and is often used in the PE setting (McKenzie et al., 1991). The observer made a decision every 20 s throughout the duration of the video while coding student behaviors and lesson context. To simplify this process, all videotapes were synchronized with a tape recorder used to cue the investigators

when to observe or record the data. For this study, student levels of activity were coded in accordance with Cardon et al. (2004). Table 1 provides an example of how each action during the lessons was coded.

Table 1
SOFIT Student Levels of Activity

SOFIT 1	SOFIT 2	SOFIT 3	SOFIT 4	SOFIT 5
Lie down with minimal movement.	Sitting on the side of the pool.	Stand in pool with minimal movement.	Walk around the pool moderately paced.	Swim with stroke of choice. Walk in waist- to chest-deep water. Swim with legs only.

For 10 s, the observer watched one student's behavior, and during the next 10 s recorded the observed data. In congruence with previous recommendations (McKenzie et al., 1991), one target individual was selected and coded at random. Every 4 min, another randomly selected student was observed, and this continued for the duration of each lesson. In line with SOFIT instructions (McKenzie et al., 1991), actual PE instruction time started when half of the class reached the instructional context and concluded when half of the class departed the instructional space.

Observer training. The initial observer training consisted of both authors watching and coding two 1-hr swimming videos simultaneously. After each 10-s interval, the video was stopped and a discussion ensued to clarify the proper description. This occurred at every interval for both hours of video. Following this, each author coded 15 additional hours of supplementary swimming lessons that were not part of this study as practice before interobserver reliability checks.

Interobserver reliability. Following the initial training, both authors watched and coded four 45-min swim lessons individual-

ly. This protocol was used in previous studies as a sufficient way to obtain interobserver reliability (Cardon et al., 2004). Reliability between both authors was calculated using interval comparisons of the test lessons. The percentages that resulted from this check were 94% (student behavior), 96% (lesson context), and 96% (teacher behavior), far exceeding the 80% recommendation by van der Mars (1989). Additional interobserver reliability checks were conducted throughout analysis to counteract observer shifting from taking place.

Data Analysis

Each percentage for student activity, lesson context, and teacher behavior for each lesson was entered into SPSS to determine the descriptive statistics for lessons taught by both teachers. The descriptive data from each instructor were then compared by employing distinct MANOVAs for student activity, lesson context, and teacher behavior. When necessary, ANOVA follow-ups were conducted. The level of significance for all inferential tests was $p < .05$.

Results

An overview of the percentages of lesson time spent in different engagement levels during swimming classes of the two swimming instructors is shown in Table 2. The average percentage of MVPA engagement during lesson time was high for Instructor 1 (58.5%) and Instructor 2 (59.3%), with a combined total (58.96%) just under 60%. Out of the five SOFIT categories, both instructors spent a majority of their time (Instructor 1 = 35.8%, Instructor 2 = 39.0%, Combined = 37.42%) in SOFIT 5 (swim with stroke of choice, walk in waist- to chest-deep water, swim with legs only), and the least observed category was SOFIT 1 for both instructors (lying down with minimal movement).

Table 2
Means, Standard Deviations, and Ranges for Percentage of Lesson Time Engaged in the Five SOFIT Activity Categories in Swimming Classes

Activity category	Instructor 1 *M* ± *SD* (range)	Instructor 2 *M* ± *SD* (range)	Instructors 1 & 2 *M* ± *SD* (range)
SOFIT 1	0.62 ± 1.1 (0–3)	0.31 ± 1.1 (0–4)	0.46 ± 1.1 (0–4)
SOFIT 2	15.2 ± 6.8 (5–25)	12.31 ± 3.7 (5–19)	13.77 ± 5.6 (5–25)
SOFIT 3	22.3 ± 5.0 (14–31)	26.7 ± 7.2 (16–43)	24.54 ± 6.5 (14–43)
SOFIT 4	22.7 ± 4.1 (14–30)	20.3 ± 3.6 (14–26)	21.54 ± 3.9 (14–30)
SOFIT 5	35.8 ± 5.6 (29–45)	39.0 ± 5.3 (26–46)	37.42 ± 5.6 (26–46)
MVPA	58.5 ± 5.6 (51–69)	59.3 ± 5.8 (49–65)	58.96 ± 5.6 (49–69)

An overview of the percentages of time spent in different lesson contexts during swimming classes of the two swimming instructors is shown in Table 3. The highest category within the lesson contexts for Instructor 1 (51.7%) and Instructor 2 (42.8%) was skill practice, with a combined total (47.31%) just under 50%. Instructor 1 (12.0%) and Instructor 2 (28.4%) spent the least amount of time in management. For the knowledge category, Instructor 1 (32.8%) and Instructor 2 (27.4%) were similar, with a combined total (30.15%) just over 30%.

Table 3
Means, Standard Deviations, and Ranges for Percentage of Lesson Time Engaged in the Five SOFIT (Lesson Context)

Activity category	Instructor 1 *M* ± *SD* (range)	Instructor 2 *M* ± *SD* (range)	Instructors 1 & 2 *M* ± *SD* (range)
Management	12.0 ± 6.4 (6–29)	28.4 ± 3.1 (23–34)	20.23 ± 9.6 (6–34)
Knowledge	32.8 ± 9.1 (16–48)	27.4 ± 1.6 (16–34)	30.15 ± 7.9 (16–48)
Skill Practice	51.7 ± 5.9 (36–60)	42.8 ± 8.2 (27–57)	47.31 ± 8.3 (27–60)
Promotes In-Class PA	96.7 ± 6.2 (82–103)	98.7 ± 11.8 (79–117)	97.69 ± 9.3 (79–117)

Discussion

The Centers for Disease Control and Prevention (2015) recommends that adolescents participate in a minimum of 60 min of PA each day. Previous research suggests that traditional PE programs fall short of helping children reach this recommendation (Scruggs, 2007). Numerous studies have demonstrated that PE classes do not provide children with enough activity to meet the health-related recommendation of 60 or more minutes of MVPA (Cardon et al., 2004; Friedman, Belsky, & Booth, 2003). With this in mind, many researchers have called to pinpoint different venues allowing for additional opportunities for children to become more physically active (Schwamberger & Sinelnikov, 2015). Many researchers have examined activity levels during recess (Mckenzie, Sallis, & Elkder, 1997; Stratton, 2000; Sleap & Warburton, 1996), but there is a lack of research evaluations of summer programs with a PE component. Therefore, there is a need to examine the level of PA in children participating in a summer swimming program.

In line with the literature (Cardon et al., 2004), this study indicated that swimming was a successful avenue for children to perform at the moderate to vigorous activity range. Both studies had similar results, with more than half of class time (58.9%) spent in the targeted MVPA range. These results further refute prior studies whose results showed extremely low MVPA during elementary swimming classes

(Warburton & Woods, 1996). These findings provide additional indications that swim instruction is viable in providing children with ample MVPA. Moving forward, it would be beneficial for schools to include introductory swim instruction in the curriculum not only for improved water safety, but also because of the high level of activity swim instruction provides.

Another important finding of this study was the low percentage of time spent in management by both instructors (12.0%, 28.4%). These results are significantly lower than those in previous studies of management time in traditional PA settings (Logan, Robinson, Webster, & Rudisill, 2015; Smith et al., 2014).

There are many potential reasons for this significantly low level of management time. One explanation may be the teacher's comfort level of the swimming content. Research suggests that experienced teachers with high levels of content knowledge of the subject they are teaching are more likely to spend less time in managerial tasks (Chen & Curtner-Smith, 2013; Ward, 2013). Both teachers in this study had extensive teaching experience with this content, likely leading to higher levels of competency. This experience may have resulted in lower levels of management time throughout the program. Examining further the link between teaching experience and decreases in management time (Melnick & Meister, 2008) in future summer programs would be beneficial.

Although SOFIT has seldom been used to examine PA levels in summer programs, the results from this study suggest that SOFIT is effective in assessing children's PA levels. There is a plethora of PA research within a traditional context (Friedman et al., 2003; Logan et al., 2015; McKenzie et al., 1995; Warburton & Woods, 1996), but few researchers have examined before-school (Beighle & Moore, 2012; Wiseman & Coe, 2014), after-school (Schwamberger & Sinelnikov, 2015), or summer athletic (Hickerson & Henderson, 2014; Wahl-Alexander & Sinelnikov, 2014) programs. The lack of research in this setting may be due to the lack of collaborations between universities and their local community or to the absence of funding generated to initiate such programs. It is clear that programs similar to this do rampantly exist; however, there has been a lack of research in which their effectiveness is addressed. Future studies implementing SOFIT are needed to address if current programs are providing students with high rates of MVPA.

The findings in this study advance the research of Cardon et al. (2004), showing that swim instruction can be an effective way to provide students with high levels of MVPA. With such a blatant necessity to increase student activity levels, this study provides evidence that supplemental summer instruction can be successful at aiding in this endeavor. Furthermore, finding instructors with extensive teaching experience will likely lead to high levels of MVPA and less management time. Although SOFIT has been effective at determining PA levels in a wide context of settings, potential studies furthering research in contexts outside of the traditional PE setting is valuable. It would be noteworthy to understand if other activities in the summer setting are as effective at providing children with high bouts of MVPA.

References

Beighle, A., & Moore, M. (2012). Physical activity before and after school. *Journal of Physical Education, Recreation, and Dance, 83*(6), 25–28. https://doi.org/10.1080/07303084.2012.10598792

Cardon, G., Verstraete, S., De Clerq, D., & Bourdeaudhuij, I. D. (2004). Physical activity levels in elementary-school physical education: A comparison of swimming and nonswimming classes. *Journal of Teaching in Physical Education, 23,* 252–263. https://doi.org/10.1123/jtpe.23.3.252

Centers for Disease Control and Prevention. (2015). How much physical activity do children need? Retrieved from http://www.cdc.gov/physicalactivity/basics/children/

Chen, Y., & Curtner-Smith, M. (2013). Hegemonic masculinity in sport education: Case studies of experienced in-service teachers with teaching orientations. *European Physical Education Review, 19,* 360–380. https://doi.org/10.1177/1356336X13495631

Friedman, S. L., Belsky, J., & Booth, C. (2003). Frequency and intensity of activity of third-grade children in physical education. *Archives of Pediatric & Adolescent Medicine, 157,* 185–190. https://doi.org/10.1001/archpedi.157.2.185

Hickerson, B. D., & Henderson, K. A. (2014). Opportunities for promoting youth physical activity: An examination of youth summer camps. *Journal of Physical Activity and Health, 11,* 199–205. https://doi.org/10.1123/jpah.2011-0263

Laosee, O. C., Gilchrist, J., & Rudd, R. (2012). Drowning 2005–2009. *Morbidity and Mortality Weekly Report, 61*(19), 344–347.

Lees, T. (2007). *Water fun.* Champaign, IL: Human Kinetics.

Logan, S. W., Robinson, L. E., Webster, E. K., & Rudisill, M. E. (2015). The influence of instructional climates on time spent in management tasks and physical activity for 2nd grade students during physical activity. *European Physical Education Review, 21,* 195–205. https://doi.org/10.1177/1356336X14555304

Maglischo, E. W., & Brennan, C. F. (1985). *Swim for the health of it.* Palo Alto, CA: Mayfield.

McKenzie, T. L., Feldman, H., Woods, S. E., Romero, K. A., Dahlstrom, V., & Stone, E. J. (1995). Children's activity levels and lesson context during third-grade physical education. *Research Quarterly for Exercise and Sport, 66,* 184–193. https://doi.org/10.1080/02701367.1995.10608832

Mckenzie, T. L., Sallis, J. F., & Elkder, J. P. (1997). Physical activity levels and prompts in young children at recess: A two-year study of a bi-ethnic sample. *Research Quarterly for Exercise and Sport, 68,* 195–202. https://doi.org/10.1080/02701367.1997.10607998

McKenzie, T. L., Sallis, J. F., & Nader, P. R. (1991). System for Observing Fitness Instruction Time. *Journal of Teaching in Physical Education, 11,* 195–205. https://doi.org/10.1123/jtpe.11.2.195

Melnick, S. A., & Meister, D. G. (2008). A comparison of beginning and experienced teachers' concerns. *Educational Research Quarterly, 31*(3), 40–56.

Pope, R. P., Coleman, K. J., Gonzalez, E. C., Barron, F., & Heath, E. M. (2002). Validity of a revised System for Observing Fitness Instruction Time (SOFIT). *Pediatric Exercise Science, 14,* 135–146. https://doi.org/10.1123/pes.14.2.135

Schwamberger, B., & Sinelnikov, O. (2015). Connecting physical education to out-of-school physical activity through sport education. *Journal of Physical Education, Recreation, and Dance, 86*(9), 39–44. https://doi.org/10.1080/07303084.2015.1085344

Schwamberger, B., & Wahl-Alexander, Z. (2016). *Swim to the top: A university based partnership focused on enhancing swimming competency.* Manuscript submitted for publication.

Scruggs, P. W. (2007). Quantifying activity time via pedometers in fifth- and sixth-grade physical education. *Journal of Physical Activity and Health, 4,* 215–227. https://doi.org/10.1123/jpah.4.2.215

Sleap, M., & Warburton, P. (1996). Physical activity levels of 5–11-year-old children in England: Cumulative evidence from three direct observation studies. *International Journal of Sports and Medicine, 96,* 248–253. https://doi.org/10.1055/s-2007-972841

Smith, N. J., Lounsbery, A. F., & McKenzie, T. L. (2014). Physical activity in high school physical education: Impact of lesson context and class gender composition. *Journal of Physical Activity and Health, 11,* 127–135. https://doi.org/10.1123/jpah.2011-0334

Stratton, G. (2000). Promoting children's physical activity in primary school: An intervention study using playground markings. *Ergonomics, 43,* 1538–1546. https://doi.org/10.1080/001401300750003961

van der Mars, H. (1989). Observer reliability: Issues and procedures. In P. W. Darst, D. B. Zakrajsek, & V. H. Mancini (Eds.), *Analyzing physical education and sport instruction* (2nd ed., pp. 53–80). Champaign, IL: Human Kinetics.

Wahl-Alexander, Z., & Sinelnikov, O. (2014, November/December). Sport education: An innovative practice for activities at camp. *Camping Magazine, 87*(6), 44–47.

Warburton, P., & Woods, J. (1996). Observation of children's physical activity levels during primary school physical education lessons. *European Journal of Physical Education, 1,* 56–65. https://doi.org/10.1080/1740898960010106

Ward, P. (2013). The role of content knowledge in conceptions of teaching effectiveness in physical education. *Research Quarterly for Exercise and Sport, 84,* 431–440. https://doi.org/10.1080/02701367.2013.844045

Wiseman, B. D., & Coe, D. P. (2014). Physical activity during a before school activity program. *Medicine and Science in Sports and Exercise, 46*(5 Suppl.), 884–887. https://doi.org/ 10.1249/01.mss.0000451288.22239.24