Kinderkinetics: Best Practice in South Africa.

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Global Forum for Physical Education Pedagogy 2014: A Resounding Success

The School of Biokinetics, Recreation, and Sport Sciences and the Research Focus Area of Physical Activity, Sport, and Recreation at the North-West University, Potchefstroom Campus in South Africa served as the hosts of the Global Forum for Physical Education Pedagogy 2014 (GoFPEP 2014). The event was focused on the theme of "Physical Education and Health: Promoting Global Best Practice." Over 80 professionals, academics, and educators from nearly 50 countries attended. GoFPEP 2014 featured lively and robust dialogue and conversation in formal and informal programs of discussion focused on what constitutes best practice. As offered in opening remarks, one of the two cofounders of GoFPEP indicated,

> It is evident that the need to improve the health and wellbeing of individuals worldwide has increasingly gained attention of all of civil society. The challenges presented by increased incidents of non-communicable diseases are growing at an alarming rate on a worldwide basis. (Edginton, Chin, & Naul, 2012, p. 32)

He further noted that a clear call to the attention of the world of the need to address this issue was made by the United Nations Secretary General Ban Ki-moon on September 19, 2011. The Secretary General called for an increased focus on preventing and controlling noncommunicable diseases. He further offered that this was only the second time in the history of the United Nations that the Secretary General discussed health-related issues to members of the General Assembly.

GoFPEP 2014 featured two keynote presentations. The first, offered by the two cofounders of GoFPEP, Prof. Dr. Ming-kai Chin and Prof. Dr. Christopher R. Edginton, was focused on the topic of "Global Perspectives of Best Practice in School Physical Education and Health: From Practice to Theory." Prof. Dr. Hans de Ridder and Prof. Dr. Hanlie Moss offered the second keynote presentation, which was focused on the topic of "Health and Physical Education in the 21st Century: A South African Perspective." In addition, several invited presentations were offered including ones from professors in Slovakia and Mozambique. Workshops that were focused on the topic of "Healthy Children Create Healthy Life Through Interactive Technology" and "Kinderkinetics" were also offered. In addition, models of best practice from India and Singapore were offered. Each delegate was required to bring a poster presentation featuring model programs of best practice. The poster presentation session was engaging. GoFPEP 2014 included greater time dedicated to poster presentations, school visits, and group discussions compared to the previous two events.

Visitations to three schools were made including to Potch Primary, Padi Inter, and Baillie Park Primary. These visitations provided key insights into the delivery of physical education and health programs in South Africa. In addition, for the first time, students were invited to perform culturally relevant performances. Movement and vocal presentations were made. These presentations were made at some of the school visits and during the forum itself. The demonstrations were able to provide insights into unique cultural physical activities, sport, and dance found in South Africa. These demonstrations enabled the delegates to witness the application of practice to theory. The singing of the South Africa national anthem by one of the school groups was especially moving.

Another unique feature of GoFPEP 2014 was the implementation of a Future Leaders Program. University students from the People's Republic of China, Germany, Slovakia, and Zimbabwe joined the group. These graduate students had a remarkable impact on the event and were active participants in the poster presentations and group discussions. The reflection of these young scholars is included in this issue of *The Global Journal of Health and Physical Education Pedagogy*. Their reflections have been important in terms of crafting future events.

A key dimension of GoFPEP is the emphasis on dialogue and conversation. Delegates were divided into discussion groups and worked to respond to nine questions: (1) What constitutes a best practice in health and physical education? (2) Which features are common among programs that are identified as exhibiting best practice? (3) How can colleges and universities work to identify promising practices, field test best practices, and research and validate best practices? (4) What best practices are available to increase capacity and efficiency to promote learning for both small and large groups of students? (5) What best practices are available to promote deeper learning approaches and linkages to real-world settings? (6) What best practices enhance accessibility by removing barriers? (7) What best practices promote greater choice and convenience for students? (8) What best practices promote a student-centered process for learning? (9) What best practices enable a personal touch between students and the teacher? Nearly all discussion groups suggested terminology should be modified to discuss "good practice, not best practice." Based on a preliminary analysis gleaned from random observations of the discussion groups, it appears best practice has to be framed in a person's cultural context. A more systematic and detailed analysis of the findings from discussion groups will be offered in a future publication. Prof. Dr. Gudrun Doll-Tepper from Germany and Prof. Dr. Suzanne Lundvall from Sweden facilitated the discussion session of the program.

Commenting on the success of the program, Prof. Dr. Walter de Oliveira (personal communication, May 21, 2014) of the Federal University of Santa Catarina and National Mental Health Association in Brazil offered the following:

> GoFPEP has given a chance for all of us to review our practices, to share concerns, and to find innovative solutions. We have advanced a tremendous power in networking, research, and development of good practices, and we have seen life as it develops in schools and in the other settings, professional and informal. GoFPEP has become more than a group; it is nearly a family. We like each other, sometimes we disagree, sometimes we get mad, and most of the time, there is a sense of caring, affection, and solidarity.

Prof. Dr. Myriam Guerra (personal communication, May 21, 2014) from the FPCEE Blanquerna, University Ramon Llull in Spain wrote,

> I don't have enough words to say to you how much I enjoyed my experience with GoFPEP in South Africa. It was really incredible, and it will always remain in my mind as something very special in my life. I hope we will have many changes in the future to share these times of working, discussion, learning, knowing about each other, our countries, culture, education activities...just to improve the world of our kids through physical education.

Prof. Dr. Marit Sørensen (personal communication, May 21, 2014) of the Norwegian School of Sport Sciences summarized her experience, indicating that as a new person to the GoFPEP movement, she did not know what to expect. She certainly did not anticipate the high level of dedication, enthusiasm, inclusion, openness, warmth—it was wonderful. Prof. Dr. Andanje Mwisukha (personal communication, May 22, 2014) from Kenya indicated that it was extremely exciting to meet colleagues from every corner of the world to share current issues and experiences in physical education and health. The forum was successful.

Credit for the success of the program may be attributed to the work of the Organizing Committee and their associated team members including faculty and students who assisted in the organization and logistics of the event. Lauded by all, the event reflected their great attention to detail, hospitality, generosity and kindness.

GoFPEP 2016 will be hosted by the Faculty of Sport Sciences at Hacettepe University in Beytepe/Ankara/Turkey. Prof. Dr. Giyasettin Demirhan will serve as president of the event. The theme of GoFPEP 2016 has yet to be established but will follow the format of a limited number of keynote and invited presentations, poster presentations, group discussions and dialogues, and visitations to schools.

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Moving Into the Future: How Physical Education Teachers Can Use the Internet to Keep Up

Rolf Kretschmann
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Abstract

Pre-service physical education (PE) teachers are exposed to the latest developments in PE research and teaching practices throughout their study program. Once they become in-service teachers, and as years progress, they are likely to detach from contemporary academic PE discussion and debate. PE teachers are usually isolated and have to take care of their individual professional development themselves. The purpose of this article was to present strategies for PE teachers to remain up to date in the areas of research findings, technology integration, equipment, lesson plans and ideas, and continuing education by using the Internet. Links for useful websites and services are provided.

Keywords: *professional development; physical education; technology; Internet*

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Introduction

Teachers will always remember their time attending college. When they were college students, they were at the forefront of scientific, clinical, and practical knowledge leading toward their future profession. However, once graduation day passed, the majority never performed the study and research side of college again. Once in service, they have to take care of their continuing education and professional development themselves. In the worst case, this means that teachers remain on the same knowledge and probably teaching skill level until retirement, after they have learned the ropes of the "natural" school environment in their beginning teacher years (Borko, 2004).

Nevertheless, college knowledge becomes outdated over time in every profession. As years in service increase and the longer graduation is ago, the danger of not being up to date increases as well. Especially in educational practice, which is a dynamic system, this may quickly lead to a lack of content knowledge and innovative teaching methods on the teacher's side (Tozer & Horsley, 2006).

In the case of physical education (PE), the so-called *old PE* may still occur in schools for an extended time. This old PE approach is solely focused on sports performance and is probably more of a sports or athletics team practice, wherein the PE teacher may be more recognized as a drill instructor than a pedagogue (Crowley Sullivan, 2013). Fortunately, a *new PE* approach has been established and manifested in the national curriculum standards for school PE, which has already been evaluated and updated (National Association for Sport and Physical Education [NASPE], 2004). New PE is about lifetime physical activity and fitness and is concentrated on all learning domains (psychomotor, cognitive, and affective), moving away from traditional competitive sports and games. These latest PE standards and the new PE approach are more than compatible with innovative teaching approaches such as integrating technology (Clapham, 2013; Mohnsen, 1997, 2012).

To achieve and maintain contemporary PE, PE teachers whose college days are long gone need to find ways to put continuing education and professional development in their own hands. Otherwise, their respective PE classes will remain static as well. Even new PE will become *old* in a few years, as society and the educational system change quickly. PE teachers will have to adapt, too. Nonetheless, the *old* teachers are not to blame if they lack specific knowledge that is enforced in the national standards. At the time they attended college, new PE had likely not been established. Even younger PE teachers may not have been exposed to certain topics in depth, as they may have not been covered within their respective study program (Ayers & Housner, 2008; Hetland & Strand, 2010).

The aim of this article was to give PE teachers guidance on how to remain up to date in the fields that affect their profession using the Internet as the ultimate resource. Twenty-first century skills such as information retrieval are important for students and teachers. Therefore, for PE teachers, knowledge of how to employ technology such as the Internet for their own professional growth is important. The question is, what can PE teachers do to maintain and develop their professional knowledge and skills?

Research Findings

It is only a matter of time when the folders containing the collected research papers from teachers' college days will become outdated and occasions to refer to them will become rare. What do teachers need to do to obtain the latest papers about a topic about which they want to

know more? They would do what students and researchers would do and what teachers did when they had to write a paper or their final thesis at college: perform a literature search in subject-specific databases. For PE, the main ones are SPORTDiscus (provided through EBSCOhost), ERIC, and PubMed (Thomas, Nelson, & Silverman, 2010).

This is the first problem. SPORTDiscus is a commercial database that only subscribers who pay for it can use. Many schools, school districts, and public libraries do not subscribe because it is too expensive. For teachers are also interested in psychological research, an attempt at using the database PsycINFO will have the same problem of restrictiveness. Furthermore, the a college library may only allow enrolled students to use its services or may be too far away. Restricted access will also be a problem when trying to download a paper in a reputable journal, as major journals in the field are available only for subscribed libraries and individuals. Buying the papers or subscribing for the whole journal is not an option for teachers, as this is too expensive in the long term.

What to do? Teachers may still use open access databases: ERIC, PubMed, Scirus, DOAJ, and Google Scholar (Table 1). For instance, ERIC covers nearly all of the important PE-relevant journals. I also strongly recommend trying Google Books (http://www.books.google.com/), as major parts in a book about a topic may be available. When teachers find a paper they want to read and it is not accessible, I recommend Googling it (http://www.google.com/). The best strategy is to put the whole title in quotation marks and to add "filetype:pdf" in the search field. This tells Google that it should only search for PDF documents. In some cases, this will reveal a downloadable PDF of the article. If this does not work, and the teacher cannot find a free version of the article online, they can track down the author via Google. The search results will most likely reveal contact information such as e-mail and phone. The next step would be making contact, telling them who you are and what you are doing, and kindly asking for a copy of the paper or a preliminary manuscript. Trying to find the paper in question on ResearchGate (www.researchgate.net/) is always worth a shot before contacting the author, as researchers are joining this network and providing free downloadable copies of their work. Occasionally, the user must be logged in to download certain papers, which requires setting up an account in advance.

Table 1
Open Access Literature Search Databases

Database	URL
DOAJ (Directory of Open Access Journals)	http://www.doaj.org/
ERIC (Education Resources Information Center)	http://eric.ed.gov/
Google Scholar	http://www.scholar.google.com/
PubMed	http://www.pubmed.gov/
Scirus	http://www.scirus.com/

PE teachers should subscribe (if they have not yet) to the newsletter *Et Cetera* by the Society of Health and Physical Educators (SHAPE, formerly the American Alliance for Health, Physical Education, Recreation, and Dance, http://www.shapeamerica.org/publications/newsletters/). The latest research findings in areas relevant for PE are usually featured within this newsletter. In addition, teachers should search the website for their state subsection of SHAPE for a newsletter to which to subscribe.

Technology Integration

Educating the "digital native" (Prensky, 2001) means integrating the ubiquitous technology with which they grew up and using it in their leisure time in school. However, using technology such as computers, laptops, projectors, video, tablets, smartphones, physical activity measurement devices, GPS, exergaming, apps, or online assets in PE requires thorough preparation and decent technology literacy (Kretschmann, 2010; Semiz & Ince, 2012).

How do teachers keep up with the dynamic of instructional technology in PE? First, they should search the Internet for the technology in which they are interested by Googling it and scanning through the findings. Second, they should obtain a copy of the latest textbooks (Mohnsen, 2012; Sanders & Witherspoon, 2012) to become comfortable with the diverse devices and applications. They should perform a literature search for technology and PE and find the papers. Many journals, especially *Journal of Physical Education, Recreation, and Dance* (JOPERD) and *Strategies: A Journal for Physical and Sport Educators* (both published by SHAPE), contain papers about using technology in PE. Searching the websites of these journals on Taylor & Francis Online (http://www.tandfonline.com) may also provide teachers with an overview. This is the point where skills in research literature, searching the Web, and technology integration in PE intertwine. If teachers are interested in the latest research findings regarding technology and PE, they may use their skills that they have developed for retrieving research findings.

I highly recommend going to the PE Geek website (http://thepegeek.com/). It is run by an Australian PE teacher who develops apps for PE. He also shares his experience using apps and other technology in PE. His website is a great source for the latest apps that may be useful for teaching PE. In addition, I suggest visiting the Inquiry & Technology in #PhysEd website (http://www.iphys-ed.com/), which provides useful scenarios and videos regarding technology use in PE. In addition, the Bonnie's Fitware Inc. website (http://www.pesoftware.com/) lists technology products that have been proven to be a good match for PE. A Facebook group named Using Technology in Physical Education is also available for teachers to post questions.

Teachers may also employ YouTube (http://www.youtube.com/) and search for the words *technology* and *PE*. PE-engaged professionals such as researchers and PE teachers share videos and presentations about using particular devices, software, and hardware in PE. These vivid ideas will inspire teachers to try the pedagogical scenarios presented in the videos. Table 2 is a list of websites related to technology and PE.

Table 2
Technology Integration in PE

Website	URL
Bonnie's Fitware	http://www.pesoftware.com/
Facebook Group: Using Technology in Physical Education	https://www.facebook.com/groups/usetechinphysicaleducation/
Inquiry & Technology in #PhysEd	http://www.iphys-ed.com/
p.e.links4u	http://www.pelinks4u.org/archives/technology/022601.htm
PE Central	http://www.pecentral.org/apps/

Table 2 (cont.)

Website	URL
The PE Geek	http://thepegeek.com/
YouTube	http://www.youtube.com/

Equipment

Fortunately, PE allows teachers to include multiple resources beyond the gym, a field, and some balls (Mosston & Ashworth, 2002). Several companies specialize in sports and PE equipment (e.g., Gopher, US Games). The equipment manufacturers promote state-of-the-art equipment for many purposes, such as physical fitness assessment, new trend sports, STEM (Science, Technology, Engineering, and Mathematics), or latest technology developments. Teachers should order their respective catalogues or browse their websites if they have not yet and do it at their earliest convenience. Even if teachers or their schools cannot afford most of the expensive equipment, they may at least come up with ideas for a future grant proposal or may change their perspective on traditional materials.

For instance, if teachers plan to do tinikling in PE, they may find tinikling sets for PE from several equipment companies. Tinikling is a Philippine folk dance that involves using two bamboo poles that are beaten, tapped, and slid on the ground and against each other and one or multiple dancers dance in between and around the bamboo poles (Lewis, 2012). After searching for cheaper alternatives to the bamboo poles, teachers will find rubber bands that may serve as a tinikling alternative that multiplies physical activity levels and reduces injury risk (Cruza & Petersena, 2003).

Exergaming may be regarded as an adequate way to include technology in PE (Barron & Chorney, 2014), but visiting a game shop in the nearby mall will not be satisfying, as commercial video game companies do not target the PE profession. However, the recently founded company Exergame Fitness (http://www.exergamefitness.com/) specializes in exergaming and children. The company offers diverse solutions for multiple educational settings. By clicking through their website, teachers will get an overview of possible exergaming equipment. Table 3 is a list of equipment-related websites and companies.

Table 3
Equipment for PE

Website	URL
Bonnie's Fitware	http://www.pesoftware.com/
Exergame Fitness	http://www.exergamefitness.com/
Flaghouse	http://www.flaghouse.com/
Gopher	http://www.gophersport.com/
Nasco	http://www.enasco.com/physicaleducation/
Palos Sports	http://www.palossports.com/
S&S Worldwide	http://www.ssww.com/sports-pe-recreation/
School Specialty	https://store.schoolspecialty.com/

Table 3 (cont.)

Website	URL
Toledo	http://www.tpesonline.com/
US Games	http://www.usgames.com/
Wolverine Sports	http://www.wolverinesports.com/

Lessons Plans and Ideas

As teaching methods and content have grown due to the new PE movement (Vandertie, Corner, & Corner, 2012), PE teachers need to widen their horizon in terms of teaching methods, content, and general instructional design. Of course, they could wait for the next national or state conference and hope demonstrations will be presented on their topic of interest, but this is not time and cost efficient. The question is, how do teachers find lesson plans that provide guidance for free and in a timely manner?

The answer is, as always, Googling it. Teachers may simply search on Google for a lesson plan on the topic they want to teach and will probably find several. In addition, the website PE Central (http://www.pecentral.org/), p.e.links4u (http://www.pelinks4u.org/), and Teach PE (http://www.teachpe.com/) have lesson plans and ideas. I also recommend searching on YouTube, as many PE teachers share their teaching ideas via video. Websites that provide PE plans and lesson ideas are shown in Table 4.

Table 4
PE Lessons Plans and Ideas

Website	URL
Hershey's Track & Field Games	http://www.aahperd.org/naspe/grants/instructionalPrograms/hershey.cfm
McREL	http://www2.mcrel.org/lesson-plans/health/healthpelessons.asp
NASPE Running Activities	http://www.aahperd.org/naspe/grants/grants/ING/activityplans.cfm
p.e.links4u	http://www.pelinks4u.org/links/unitplans.shtml
PE Central	http://www.pecentral.org/lessonideas/pelessonplans.html
PE Scholar	http://www.pescholar.com/resources/
SPARK	http://www.sparkpe.org/physical-education/lesson-plans/
Teachers.Net	http://teachers.net/lessonplans/subjects/physical_education/
Utah Curriculum Resources	http://www.uen.org/Lessonplan/LPview.cgi?core=16
YouTube	http://www.youtube.com/

Continuing Education

Most colleges offer online classes that are 100% online, using a virtual learning management system and occasional web conferencing. After browsing through the graduate schools' online programs, teachers may decide to go back to school "virtually" and enroll in classes they find interesting. The gathered experience in studying online and participating in e-learning activities may also inspire teachers to implement the virtual teaching methods to which they were exposed in their own PE classes. They would have to pay tuition, though.

A more cost-efficient approach is a webinar, an online seminar that is meant to be an event of continuing education (Cassner & Adams, 2012). Webinars usually last from 1 to 3 hours. One or more invited expert speakers will give an online presentation (slides plus talk), which the event coordinator will moderate. Participants are able to ask questions via chat or audio depending on the virtual presentation environment. The advantage is the interaction with the speakers, which makes a webinar more valuable than a video lecture or podcast. For instance, SHAPE, the National Association for Sport and Physical Education (NASPE), and occasionally Great Activities (https://greatactivitiesonline.com/) offer free webinars dedicated to PE-relevant topics.

Sharing Personal Experience

PE teachers are usually lone fighters for the subject of PE. If they want to escape the PE teacher's isolation and share and discuss what is on their mind, or if they want to ask a question about a recent event, they have several options.

Teachers should start by subscribing to the NASPE-L Listerv. The NASPE-L Listserv is a mailing list where PE teachers may share and discuss their ideas about their teaching and their programs (Pennington, Wilkinson, & Vance, 2004).

NASPE also runs the online forum NASPE-Talk (http://naspetalk.com/forum). Another NASPE forum is hosted by p.e.links4u (http://www.pelinks4u.org/naspeforum/cgi-bin/discus/discus.cgi) and has more entries than NASPE-Talk. Last but not least, the Facebook group PE Central helps PE teachers connect with other PE teachers. A list of social networking websites for PE teachers is provided in Table 5.

Table 5
Social Networking and PE Teachers

Website	URL
A to Z Teacher Stuff	http://forums.atozteacherstuff.com/forumdisplay.php?f=126
Facebook Group: PE Central	https://www.facebook.com/groups/pecentral/
NASPE-L Listserv	http://www.pecentral.org/professional/naspe-l/
NASPE-Talk	http://naspetalk.com/forum
NASPE Forum	http://www.pelinks4u.org/naspeforum/cgi-bin/discus/discus.cgi
Phys Ed Teachers/Coaches Chatboard	http://teachers.net/mentors/phys-ed/

TMI (Too Much Information)?!

My intention was to share tips with PE teachers, hoping to provide them with material to take serious actions in regard to professional development, thereby being able to take matters into their own hands, using only the Internet. Only one problem remains: working through the material found on the Web. World Wide Web resources are endless and unlimited. Teachers should not panic whenever it seems there is TMI (too much information). They should not be confused. They should focus on small pieces and tasks. Rome was not built in a day. Part of learning is always selecting relevant information. In this case, whatever helps modernize teachers' knowledge is relevant. In other words, PE teachers decide what is relevant. Teachers should take their time and try not to become lost in cyberspace.

Becoming a master teacher will not happen overnight (Graham, 2008). As PE teachers have spent several years obtaining a college degree, they will most likely have to take the time to work themselves back to the top of contemporary PE knowledge and debate. The Internet may be a great weapon to employ for individual continuing education and professional development. Nevertheless, as with knowledge and societies, the Web changes quickly. Websites pop up and disappear every day. It is up to PE teachers to keep up.

Conflict of Interest Statement

I hereby declare that there is no conflict of interest in regard to financial support, commercial or financial involvement, and agreement with any sponsor affiliated with any association, company, individual, organization, and website featured in this paper. I described procedures using Google because they are part of my personal routine with which I am comfortable. It is my personal preference, nothing more, nothing less. I explicitly highlight that other Web search engines (AltaVista, Bing, etc.) provide similar functionalities compared to the ones to which I referred in this paper.

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Strengthening Disease Prevention Efforts: Conceptualization of Healthy Living

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Abstract

Chronic diseases affect nearly two thirds of the world population. A direct link between individual lifestyle and the risk of chronic diseases has been well established. Although considerable efforts and resources have been devoted to disease prevention, the prevalence of chronic diseases is still on the rise. One of the approaches to revert the trend is to educate the public about disease risk factors and components of a healthy lifestyle. Traditionally, health education has been focused on disseminating health messages and teaching behavior modification strategies. However, little is known about how individuals conceptualize healthy living and integrate it in their daily lives. The author focused on conceptualization of disease prevention by individuals and its relevance to strengthening disease prevention efforts.

Keywords: *disease prevention; health education; conceptualization*

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Introduction

Healthy living and disease prevention are related concepts. It is common knowledge that a healthy lifestyle averts or considerably delays chronic diseases. Disease prevention is underscored not only because of its direct benefits to the individual but also because timely measures substantially reduce the economic burden of treatment (Bauer, Briss, Goodman, & Bowman, 2014). Common knowledge, however, does not always translate into common practice, as evident by a large percentage of the world population affected by chronic diseases. The following discussion is focused on the conceptualization of disease prevention by individuals and its relevance to strengthening disease prevention efforts.

Researchers and health professionals have come to understand that disease prevention encompasses a complex framework of collaborative efforts and strategies that must be employed at multiple levels including individual, community, organizational, and legislative (Bauer et al., 2014). Such efforts range from educating the public to modifying environments to adopting health policies. Undoubtedly, population-wide disease prevention efforts are important. However, that discussion is beyond the scope of this article, which is limited to disease prevention and healthy living from the individual's perspective.

The public's understanding of disease prevention has been characterized in the literature largely from a decision-making point of view, namely, factors that facilitate or discourage healthy behaviors. Such factors have been sufficiently researched and include level of education, socioeconomic status, attitudes, and social support. Considerably less is known about how individuals conceptualize prevention. What does the term *prevention* mean to a layperson? Prevention is a simple notion to grasp. For most people, it signifies eating healthy, exercising, wearing a seat belt, not smoking, and taking common sense precautions not to put oneself at risk for a disease or accident. If that is the case, why do so many people fail to adhere to these simple guidelines?

Sources of Information

Although certain preventive behaviors such as getting a yearly physical examination or wearing a seat belt are straightforward actions with little controversy about them and minimal time commitment, others, namely, healthy eating and physical activity, are complex and ambiguous. The definitions of healthy eating and adequate physical activity remain moving targets and are subject to disagreement, even among health professionals. Government officials and professional organization personnel have developed lengthy documents to help the public navigate through complex and often controversial research findings toward what at the moment is thought to be an optimal food–activity combination. In the United States, such documents are the Dietary Guidelines for Americans (U.S. Department of Agriculture, 2010) and the Physical Activity Guidelines for Americans (Physical Activity Guidelines for Americans Midcourse Report Subcommittee of the President's Council on Fitness, Sports, & Nutrition, 2012).

How do people learn preventive strategies? People are educated about health in several settings. Health guidelines and practices are taught in families, taught in schools and colleges, conveyed by the media, communicated by health providers, and gained from self-help literature. However, as people receive the abundance of information through various outlets, which messages get through and which ones are filtered out? Furthermore, how do individuals process this often random and controversial information? Do they compartmentalize these pieces into categories such as diet, physical activity, and weight management, or do they align them with

previously learned information and use them as part of their personal lifestyle philosophy? An equally important question is, when and how is this information used?

Information Processing

Living a preventive lifestyle goes beyond awareness of health guidelines. It also means having the right attitude, motivation, and necessary skills. Thus, researchers often infuse behavioral theories into health interventions and educational programs to make the transition to healthy living successful (Glanz & Bishop, 2010). Researchers have explored individuals' knowledge, perceptions, attitudes, and other psychological constructs of health behavior. Yet one theme is not in research literature: the big picture, the understanding of whether and how the individuals put together pieces of a health information puzzle in the context of their culture, capabilities, and life circumstances. Tapping into a person's mind-set may be an important clue to solving the from-knowing-to-practicing challenge.

In research on cognition, the bottom-up and top-down theories of learning have gained recognition. In the bottom-up theory, individuals' skill acquisition occurs in the bottom-up fashion that advances from procedural to declarative knowledge (Sun, Merrill, & Peterson, 2001). In the field of computer sciences, for instance, the bottom-up algorithm infers to the synthesis of incoming segmented pieces of information into a whole image, object, or system (Levin & Weiss, 2009). In application to human well-being, in the bottom-up approach, an individual's level of life satisfaction is the outcome of frequent positive experiences in interpersonal, professional, and financial domains (Brief, Butcher, George, & Link, 1993). In contrast, in the top-down theory, a person's acquired conceptual knowledge precedes practical skill development (Sun et al., 2001). In the computer sciences example, the top-down algorithm would begin with a whole image that is subsequently segmented into fragments to capture important details. The fragments may then be rearranged into a novel image (Levin & Weiss, 2009). With respect to well-being, in the top-down approach, a person's life satisfaction is not a mere reaction to life circumstances. Rather, individuals possess a certain mind-set and react to life events through the prism of their own disposition. Thus, someone with a positive outlook is able to experience life satisfaction even in unfavorable conditions (Brief et al., 1993).

Regardless of the area of application—computer sciences or psychology of well-being—researchers can and should integrate the bottom-up and top-down approaches to optimize learning (Sun & Zhang, 2004), create an efficient performance system (Levin & Weiss, 2009), and reach an understanding of personal happiness and well-being (Brief et al., 1993).

Bottom-Up Approach to Healthy Living

Researchers may apply the bottom-up and top-down theories to understanding individual preventive behavior. In the bottom-up approach, individuals gradually acquire information and a set of skills to practice healthy eating. They may seek information about food components and their effects on health (knowledge) and learn to read food labels, plan meals, and prepare healthy recipes (skills). The transition to a healthier lifestyle, however, does not stop at dietary changes. People may also seek knowledge and skills to increase physical activity and manage stress in an attempt to achieve physical and emotional well-being. Furthermore, people should be able to customize and fine-tune preventive behaviors according to their age, gender, physical state, abilities, and life circumstances.

Considering the time and effort it takes to gain, customize, and implement complex preventive behaviors, achieving a truly healthy lifestyle may become a monumental,

overwhelming task for the average person. Thus, it is not surprising that many people seem to be stalled in the contemplation phase despite being aware of the need to eat better and move more. Health professionals sometimes wonder why their patients lack the motivation to take better care of themselves. It is hard to imagine that people would intentionally choose not to care about their health. But in the context of daily essential responsibilities and competing priorities, people may set aside only a small portion of time for health-enhancing activities. When it comes to health, however, small efforts lead to small gains.

For a healthy society to develop, a lifelong health education and disease prevention system must be in place. For people who are fortunate to be brought up and live in an environment that promotes and supports preventive behaviors, healthy living comes naturally and effortlessly. Children who are served nutritious meals and given opportunities to be active internalize these behaviors (Larson, Fulkerson, Story, & Neumark-Sztainer, 2012; Telama et al., 2005). Children may have a simplistic conceptualization of healthy living, but they gain practical knowledge and skills to conduct a healthy lifestyle in adulthood. Thus, using the bottom-up approach, a person can build a solid health foundation throughout childhood. In contrast, children who develop in an environment that does little to educate and support preventive behaviors not only are at higher risk of early onset health problems but also lose valuable time to develop the fundamentals of healthy living. To the former child, information is given over the years in small manageable doses so it can be understood and practiced until it becomes a habit. The latter child may receive a crash course on healthy living later in life, but breaking a decade's worth of powerful old habits would take considerably greater effort and motivation.

Top-Down Approach to Healthy Living

The bottom-up approach plants seeds that eventually grow into a complex system of health values, whereas the top-down approach is rooted in a big picture: understanding healthy living and how it fits with other aspects of life. Research on this subject is scarce. One study came close to gaining insight into personal philosophy underlying food consumption. Delaney and McCarthy (2014) used a semiquantitative interview to question participants, 50- to 70-year-old Irish adults, about their beliefs and perspectives on healthy eating. The particular angle of this study was to determine how participants conceptualize, negotiate, and reconcile their moral values and food choices in the context of their daily lives. The participants reported facing interesting dilemmas, one being food moralism. For example, certain cultural, religious, and health messages portray food as a functional necessity, something not to be enjoyed ("we eat to live" as opposed to "we live to eat"). People who find food to be a source of pleasure feel guilt over such messages. Another dilemma was changes in food availability and information about food and health. In the past, food supply was limited. Thus, food decisions were simple: People ate what was available when they felt hungry. The food abundance nowadays coupled with an emphasis on disease prevention has turned eating into a conscious effort, a sacrifice of "unhealthy" foods, which are perceived as enjoyable and comforting, in favor of unsatisfying healthy options. Thus, individuals' food-related moral strength is partly determined by their ability to resist unhealthy choices. People associate failure to resist with guilt, anxiety, rationalization of behavior, or rebellion against official dietary advice. The latter outcome—a distrust for generalized health messages—stems from individuals' own experiences that contradict the premise of health advice, rejection of the one-size-fits-all approach, conflicting health information, and preference for autonomy when it comes to decisions concerning personal health (Delaney & McCarthy, 2014).

Delaney and McCarthy (2014) gave a glimpse into a complex interaction of thoughts, emotions, personal experiences, and external influences that shape people's relationship with food. Moreover, consistent with the earlier discussion that for many people a healthy lifestyle is a monumental task, Delaney and McCarthy stated,

> Simplistic notions of eating a particular way as a solution to health problems were rejected, rather emphasizing a more holistic approach in which participants considered that different lifestyle behaviors could compensate for or balance each other. For many participants, physical activity offered an alternative and could compensate for eating choices and suggests that food healthiest ideology was located within a larger moral space. (pp. 110–111)

Thus, at least in adulthood, people are influenced by conceptualization of healthy living within the context of their life. Traditionally, health education has been largely focused on disseminating health messages and teaching behavior modification strategies. This approach has worked for individuals. For others, knowledge of what to do and how to do it may not be sufficient to elicit behavior change unless it is aligned with their lifestyle philosophy.

Potential Benefits of Conceptualization

Conceptualization of healthy living may be worth researching and including in health curricula. Although health information sources are readily accessible and competing for consumers' attention, consumers ultimately must weed out clever but unsubstantiated trends such as fad diets from scientifically sound advice. Conceptualization of a preventive lifestyle could be a framework for separating health facts from fiction and a motivator to keep people on course. Conceptualization is individual sensitive. The parameters of healthy living at age 70 are different from those at age 20. Table 1 is a framework for conceptualizing a preventive lifestyle that is suitable for young, healthy individuals. It is an onward view, a glimpse into the future, contrasting a preventive lifestyle and its alternative (i.e., disease coping). This framework would not work for an older adult whose likely goal is to prevent worsening of existing health problems.

Table 1
Sample Framework for Conceptualization of a Preventive Lifestyle and Its Alternative

Preventive lifestyle	Alternative
Living a lifestyle that includes activities one wants and likes doing without hindrance caused by ailments.	Living a lifestyle that accommodates one's disease.
Educating self about healthy living.	Educating self about a disease, its management, treatment options, and treatment facilities.
Autonomy and self-control over behaviors that affect health.	Being dependent on decisions of others (a health care provider, a caregiver) pertaining to disease treatment.
Development of a personal health philosophy.	Development of a coping philosophy.
Cost: nutritious foods, a membership to a fitness club (optional)	**Cost:** medication, medical procedures, and care (on top of nutritious foods, as treatment of chronic diseases often requires lifestyle change)

The framework in Table 1 contrasts disease prevention and treatment lifestyles. Each point of distinction may be supplemented by discussion and examples to which individuals can relate.

Conclusion and Application

Nutrition and physical activity guidelines tend to change as more research is conducted and published. However, even when health guidelines are straightforward, their application is not. Does an adult who exercises daily, eats plenty of fruits and vegetables, but also consumes sweets twice a day practice healthy living? Does a vegetarian who gardens two to three times a week but does not exercise regularly lead a healthy lifestyle? Is someone who works out 1 hour a day, diligently plans her low-fat meals, but has a high stress job better off than someone who is on the verge of meeting dietary and physical activity recommendations but has a fulfilling and stress-free life? In other words, notwithstanding the extremes, is living a healthy lifestyle possible when lacking in one area of disease prevention but doing more in the other? Many individuals have searched for an answer to this question. Perhaps, people can compromise through conceptualization of healthy living and finding its place in their life.

Conceptualization of healthy living may be viewed as a continuum. For young children, a greater emphasis is placed on developing quality practical knowledge and skills (the bottom-up approach). As children grow older and improve critical thinking, their emphasis on conceptualization should increase. For adults who are contemplating making lifestyle changes, conceptualization may be a starting point (the top-down approach). It may be a motivator to allot more time and effort to gaining knowledge and skills associated with healthy living. Health professionals should research and develop conceptualization themes that are simple, relatable, and powerful enough to affect individual behavior.

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Where Is the Truth? Students' Real, Observed, and Perceived Physical Activity During Physical Education Lessons

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Abstract

Heart rate telemetry and direct observation are commonly used to assess students' physical activity during physical education lessons, and researchers have indicated a large variation in student activity. Therefore, the aims of this study were to investigate the association among measured, observed, and perceived physical activity and to assess physical activity levels during elementary physical education lessons. Seventeen fifth grade students and 14 sixth grade students were taught by a physical education specialist for three lessons each. Both classes had coed physical education lessons, and all students were systematically analyzed using heart rate measurement, systematic observation, and perceived exertion. These elementary students were engaged in moderate to vigorous physical activity about one third of the scheduled physical education time and perceived exertion as light. Boys were more active than girls. A large variation was found between individual students. Observational data were associated with average heart rate, and maximal heart rate was associated with perceived exertion. Higher physical activity values than heart rate measurements were found. Discrepancies in the strength of associations among physical activity measures highlight the value of combining instruments when students' physical activity is measured and evaluated.

Keywords: *physical activity; physical education; heart rate monitoring; SOFIT; perceived exertion*

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Introduction

Physical education (PE) is essential in helping children attain the physical fitness, motor skills, and knowledge that will help them to participate in leisure-time physical activities. However, the attainment of moderate to vigorous physical activity (MVPA) has been important in recent years. Therefore, knowing how much students are moving in the gym and how to accurately assess that is important. The traditionally most widely used tools to assess physical activity are heart rate telemetry and direct observation. Roberts and Fairclough (2011) used systematic observation and reported that students were engaged in high levels of inactivity during games classes in high school PE, and this was consistent across striking games, net or wall games, and invasion games. Researchers in the United States have found third grade children engaged in MVPA about 37% of PE lesson time, less than the 50% recommended by Healthy People 2020 (McKenzie et al., 1995). However, in Hong Kong, Chow, McKenzie, and Louie (2008) found that students' physical activity levels reached the 50% level of engagement time and that subject matter selected by teachers, the way they delivered it, and teachers' behavior during lessons were significantly related to the intensity of student physical activity during lesson time. In addition, activity levels varied largely according to the main theme content and among lessons having the same theme.

As these examples show, student physical activity during PE lessons is widely studied. Stratton (1996) performed the first review of PE heart rate research and concluded the majority of PE lessons do not stimulate appropriate amounts of MVPA. In more recent reviews of 84 studies (Fairclough & Stratton 2005a, 2006), most of them in the United States and the United Kingdom, researchers focused on the amount of active lesson time during elementary and secondary school PE. They concluded that during elementary school PE, students engaged in MVPA for an average of 37% of lesson time. In secondary schools, the amount of time students spent in MVPA during PE lessons varied between 40% for heart rate monitoring and 28% for observational data.

Most observational studies of physical activity during PE have been relatively short term, but Senne, Rowe, Boswell, Decker, and Douglas (2009) reported 33% MVPA time over an entire academic year of middle school PE classes in one school. Although most researchers have reported MVPA levels lower below 50% of lesson time, Jaakkola, Liukkonen, Laakso, and Ommundsen (2008) reported high MVPA (61%) for ninth grade students during game play, a floorball lesson. Also, Slingerland, Haerens, Cardon, and Borghouts (2014) found boys spent 74% and girls 64% of time in MVPA during game play. They discussed that this high level could lead to a ceiling effect, leaving no room for instruction. On the other hand, Romar, Fagerström, and Granlund (2011) used heart rate monitors as a teaching tool and found that elementary students engaged in MVPA for an average of 25% of lesson time. In this study, heart rate monitors were part of the intended instructional strategy, which most students liked, and they enjoyed following their heart rates.

Several researchers have found higher levels of MVPA among boys than girls during coeducational classes. Researchers have noted this distinction when they have used heart rate monitors to assess students' physical activity (Fairclough & Stratton, 2005c; Hodges Kulinna, Martin, Lai, Kliber, & Reed, 2003; Slingerland et al., 2014; Stratton, 1996), accelerometry (How, Whipp, Dimmock, & Jackson, 2013), and direct observation (McKenzie, Marshall, Sallis, & Conway, 2000; McKenzie, Prochaska, Sallis, & LaMaster, 2004).

This gender evidence is not robust. Laurson, Brown, Cullen, and Dennis (2008) reported that boys were more active during team activities and girls were more active during individual activities, whereas Sarradel et al. (2011) showed that girls had higher physical activity levels than boys during several high school PE lessons. Moreover, Van Acker, Carreiro Da Costa, De Bourdeaudhuij, Cardon, and Haerens (2010) showed that by using a modified game form, girls (69%) spent overall more time in MVPA than boys (57%). Aelterman et al. (2012) confirmed these mixed results, reporting that boys had significantly higher MVPA levels than girls in ball and racquet games and that no gender differences existed in artistic sport and fitness training.

Lonsdale et al. (2013) showed in a recent review that interventions can increase the amount of time students spend in MVPA during PE lessons. However, only six of the 16 reviewed studies showed a percentage of more than 50% in MVPA in the follow-up measurement. Advocates of 2008 Physical Activity Guidelines (U.S. Department of Health and Human Services, 2010) have suggested using the recommendation that students are engaged in MVPA for at least 50% of PE class time as an accountability measure for school PE, and therefore, most researchers have focused on this variable. Other researchers have used almost similar constructs in their studies, namely, time spent in target heart rate zones (Laurson et al., 2008) and time in and above target heart rate (Gao, Hannon, & Carson, 2009). However, mean and maximal heart rate are other variables that are easily accessible from heart rate measurements. In soccer, for example, Alexandre et al. (2012) reported in a review that the mean heart rate recorded during match play ranged between 165 and 175 bpm in competitive and friendly match play. Researchers have found that average heart rate in PE lessons varies from 114 bpm (Laurson et al., 2008), 132 bpm (Lyyra, Heikiaro-Johansson, Johansson, & McEvoy, 2008), 135 bpm (Sarradel et al., 2011), 142 bpm (Wydra, 2009), 140 bpm (Gao et al., 2009), 147 bpm (Jaakkola et al., 2008), and 159 bpm (Van Acker et al., 2010).

As researchers have found that motivational aspects have an effect on student activity (How et al., 2013), perceived exertion is also a possible factor that relates to physical activity behavior in children. Therefore, rating of perceived exertion has been suggested to be an appropriate measure of exercise intensity. It is thought to represent many factors affecting the intensity of physical activity such as students' psychological state and training status. Borg (1982) designed the first Rating of Perceived Exertion (RPE) Scale, and researchers have found it to be a simple and valid method for quantifying whole training session intensity for children and adolescents (Chen, Fan, & Moe, 2002; Pfeiffer, Pivarnik, Womack, Reeves, & Malina, 2002). Young males showed in soccer-specific small-sided games an average perceived exertion of 16 to 17 (Abrantes, Nunes, Maçãs, Leite, & Sampaio, 2012), and Coutts, Rampinini, Marcora, Castagna, and Impellizzeri (2009) found from the same context that rating of perceived exertion correlated well with traditional markers of exercise intensity. Therefore, researchers could provide additional understanding of students' physical activity during PE lessons using perceived exertion, and Wydra (2009) reported that 43% of the students perceived the PE lesson to be at least somewhat demanding (at least 13 of 20 on the Borg Scale). Similarly, Marmeleira, Carrasqueira Aldeias, and dos Santos Medeira da Graça (2012) found that students experienced a light degree of physical exertion in PE lessons with an average of 11.6 on the Borg Scale.

Although Fairclough and Stratton (2006) reported different MVPA values for heart rate and observation measurement of student activity, most researchers have used a single instrument in their studies of PE lessons (e.g., pedometer, accelerometer, heart rate monitor, direct observation). Each instrument has strengths and limitations. Pedometer and accelerometer data are used to measure physical movement, volume of physical activity (i.e., steps), and intensity

of physical activity (i.e., bouts), respectively, although heart rate monitors are used to assess the physiological response to that movement. Because these are different devices, some of the results may be difficult to interpret. In addition to measuring the physiological response of the body to movement, heart rate monitors may react to variations caused by emotional changes, which may occur when little or no physical activity is occurring. A correlation of 0.26 between accelerometer and heart rate data shows that these instruments measured a different dimension of physical activity, and Fairclough (2002) suggested that if possible, researchers should consider measuring the physiological load (heart rate monitoring), quantity of movement (accelerometry or pedometry), and the quality of movement (systematic observation) within PE lessons.

Altogether, researchers seem to indicate a large variation in student activity depending on student variables and context. Verstraete, Cardon, De Clercq, and De Bourdeaudhuij (2007) reported that accelerometer data showed remarkably higher percentages of MVPA engagement compared to SOFIT (System for Observing Fitness Instruction Time) observational data, which means that different ways of measuring will provide additional variation in the data. In addition, Fairclough and Stratton (2005a) analyzed MVPA with heart rate measurement and observation and found that the percentage of time that students were active differed markedly, with heart rate measurement showing higher values than SOFIT. One explanation was that although heart rate was continuously measured from all students, SOFIT was obtained from four students' physical activity behaviors during different lesson intervals. On the other hand, Marmeleira et al. (2012) reported that the number of steps and the rate of perceived exertion were associated with levels of physical activity measured by heart rate monitors.

Inconsistencies among physical activity measures and context highlight the advantage of combining instruments when assessing students' physical activity. Lyyra et al. (2008) suggested that heart rate measurement compared to observation data and student self-reports would be beneficial to obtain a deeper understanding of students' physical activity in PE lessons. Therefore, the aim of this study was to employ multiple methods to investigate the association among measured, observed, and perceived physical activity. A secondary aim was to assess physical activity levels during elementary PE lessons.

Methods

Participants and Setting

A class of 17 fifth grade students and another class of 14 sixth grade students were taught by a PE specialist for three lessons each. The male teacher, with a master's degree, had 6 years of experience and had been employed at the elementary school for the last 5 years. He generally used a direct instruction style of teaching and actively supervised his students. This public elementary school (Grades 1 to 6) served 100 students from neighborhoods with families of predominantly middle socioeconomic status.

Both classes were coeducational and did not share the activity space with other classes. The study occurred during an indoor multiactivity unit (ballgames, fitness) in a gym with about 400 m^2 available space. Each lesson lasted from 39 to 48 min, and generally 10% of the time was allocated for pre- and postmanagement and the rest of the time for circuit training, skill instruction, station teaching, and game play. The first lesson for both groups consisted of a short aerobics warm-up followed by circuit training. The second and third lesson consisted of skill practice and game play; fifth grade students played team handball and sixth grade students played basketball. The PE teacher was instructed to teach the lessons as he typically would.

He was asked not to place unusual emphasis on tasks that would increase heart rates more than normal (e.g., fitness work or circuit training), unless this was what he normally would have focused on in the lesson.

Instruments and Procedures

Students were systematically analyzed using heart rate measurement, systematic observation, and perceived exertion. Each lesson was videotaped with two cameras for further analysis, and percentages of lesson time spent in MVPA were recorded for each student. Seventy-nine assessments of physical activity were conducted during six PE lessons. Prior to participation, the study was explained and written informed consent was obtained.

Researchers have shown heart rate (HR) telemetry to be a valid and reliable measurement of physical activity and has been used widely in PE settings (Bar-Or, Bar-Or, Waters, Hirji, & Russell, 1996; Trieber et al., 1989). Student heart rate levels during each PE lesson were measured using Polar Team System heart rate monitors, developed by Polar Electro, Finland. Students were fitted with the heart rate telemeters after they changed clothes and immediately before they entered the gymnasium. Heart rate was recorded every 5 s. At the end of the lessons, the heart rate telemeters were removed, and the investigators downloaded the heart rate data to a portable PC using the specific software (Polar Advantage™ Polar Electro, Kempele, Finland) and subsequently exported and analyzed the data.

Average heart rate, maximal heart rate, and MVPA for each lesson was calculated from the heart rate measurement. Values were calculated for percentage of active lesson time in the category MVPA. The MVPA level is moderate physical activity, the minimal intensity required to contribute to the recommended volume of health-related activity. The heart rate cut point for MVPA was 140 bpm for boys and girls and was based on values in previous research (Armstrong & Bray, 1991; Armstrong, McManus, Welsman, & Kirby, 1996).

The System for Observing Fitness Instruction Time (SOFIT) was used to systematically observe students' level of MVPA. Physical activity levels, lesson context, and teacher promotion may be analyzed with SOFIT. Validity of the activity level behaviors categories for use with school students has been demonstrated (Rowe, Schuldheisz, & van der Mars, 1997). However, in this study, we were interested only in student activity. Therefore, we did not observe lesson context and teacher promotion. SOFIT momentary time sampling and interval recording instrument procedures have a scale from 1 to 5 to rate physical activity levels. Non-MVPA categories include lying down (1), sitting (2), and standing (3) and MVPA categories (4 & 5) include behaviors that are equivalent to or more active that brisk walking and high-intensity activities (VPA). Time spent in MVPA was obtained by summing the amount of lesson time spent in the walking and very active categories. Physical activity levels were classified by observing each student for 5 s and then recording their level of active engagement for 5 s. Three students were observed during one viewing of the videotape, and therefore, each student was observed and recorded twice for 1 min. A log of activities and coding rules was kept to provide consistency in coding. Guidelines for observer training and data collection using the instrument were grounded in the technical descriptions of the SOFIT training manual (McKenzie, 1998). Coding rules for MVPA categories of walking (Level 4) and very active (Level 5) were developed so running, aerobics, actively engaged in abdominal curls, throwing balls, transitions from standing or sitting to walking or running were coded as MVPA. Interobserver agreement was conducted by following three students from one lesson during the pilot study, and the mean

interobserver agreement percentage for students' MVPA was 96.4%.

The Borg RPE Scale is a widely used instrument to measure perceived exertion, or exercise intensity (Chen et al., 2002). The Borg RPE Scale was used to measure perceived exertion during the lessons. The scale consists of numbered categories from 6 to 20 and verbal cues, from "very, very light" to "very, very hard." Before the first lesson, students were familiarized with the scale: perceived exertion was defined, the perceptual anchors were defined, the use of the scale was explained, and questions were answered. At the end of each PE lesson, the students rated the perceived exertion level and estimated how hard they had been exercising.

Data Analysis

Data were analyzed using SPSS for Windows (21.0). Means and standard deviations were calculated for each variable. Student gender and grade level were independent variables in the statistical analysis. An independent samples *t* test was used to compare measurements between genders and grades, and Pearson's correlation test was used to study the association among measures.

Results

The descriptive statistics for each measure by gender and grade level and for the total sample are presented in Table 1.

Table 1
Descriptive Statistics for Heart Rate, SOFIT, and Borg Scale Values

	HR mean		HR max		MVPA %		SOFIT %		Borg Scale	
	M	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***	***M***	***SD***
All students	128.7	(14.2)	182.4	(16.4)	35.3	(19.5)	41.3	(8.5)	12.8	(2.1)
Min, Max	96, 159		143, 217		0.0, 77.3		29, 71		6, 17	
Boys (n = 39)	131.7	(13.6)	185.7	(11.4)	39.4	(19.3)	43.8	(9.1)**	12.8	(2.3)
Girls (n = 40)	125.8	(14.3)	179.2	(19.8)	31.4	(19.2)	38.8	(7.2)**	12.9	(1.9)
Grade 5 (41)	130.0	(11.9)	183.6	(13.6)	38.5	(18.2)	42.6	(9.4)	12.7	(2.1)
Grade 6 (38)	127.4	(16.4)	181.0	(19.1)	32.0	(20.6)	39.9	(7.3)	13.0	(2.2)

**$p < .01$

Elementary students were engaged in MVPA 35.3% (heart rate) and 41.3% (SOFIT) of the scheduled PE class time. Students' average heart rate was 128.7 bpm, with a range of 96 to 159 bpm, and their maximal heart rate was 182.4 (SD = 16.4). Boys were more active than girls, although only SOFIT showed a statistically significant difference, and there was a trend that fifth grade students were more active than sixth grade students.

A large variation was found in data between individual students and different lessons, particularly for MVPA and SOFIT data (see Figures 1 and 2). Students reported an average of 12.8 on the Borg Scale, which indicated the perceived exertion was light.

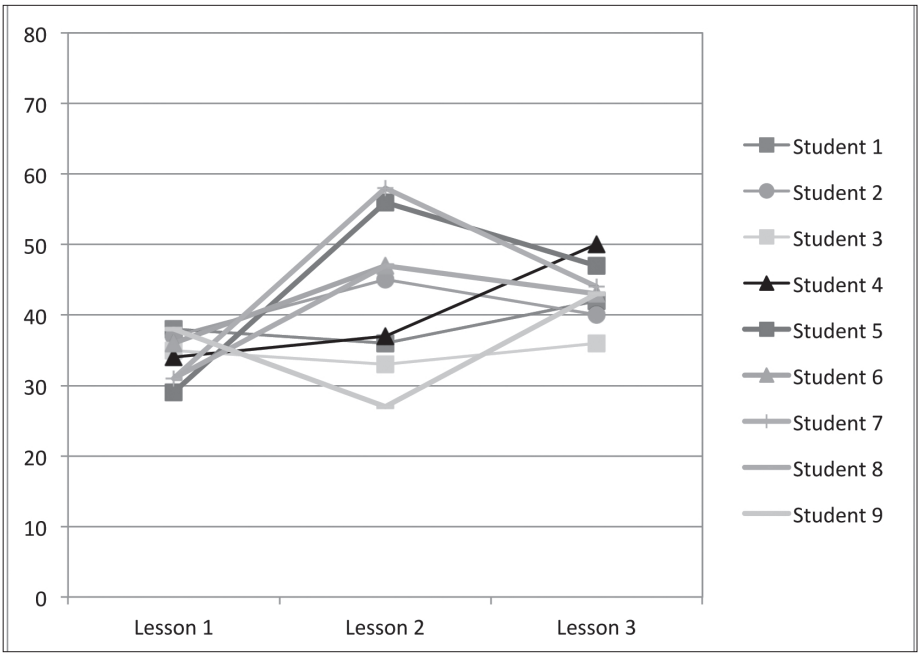

Figure 1. SOFIT values for students in Grade 6 during three lessons.

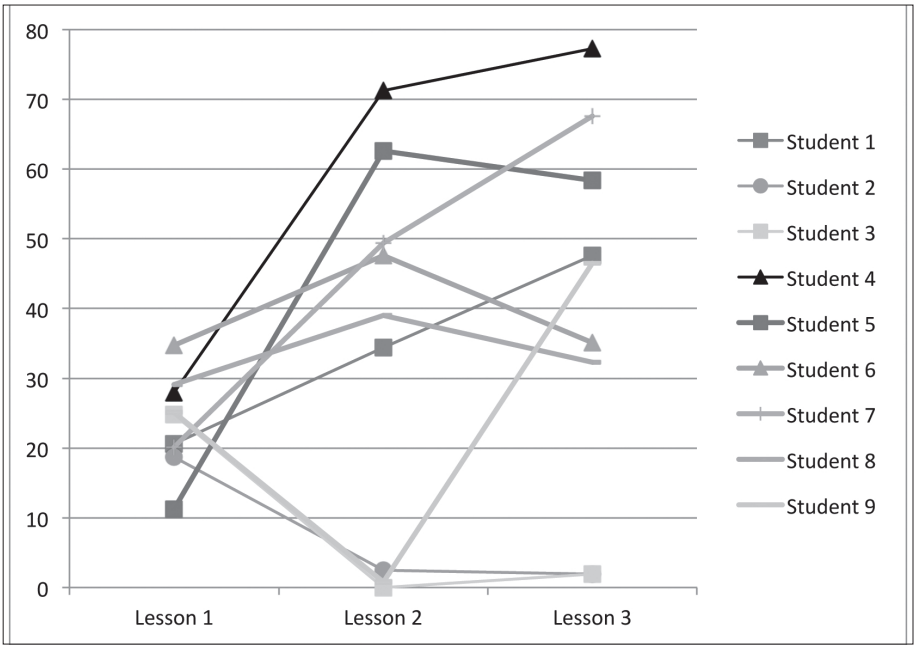

Figure 2. Heart rate MVPA values for students in Grade 6 during three lessons.

Associations among the studied variables are presented in Tables 2 and 3. A high positive correlation was found among all three heart rate measurements, where heart rate average had extremely high association with MVPA heart rate data.

Table 2
Relationship Among Heart Rate Values, SOFIT, and Borg Scale for All Students

	HR mean	HR max	MVPA %	SOFIT %
HR mean				
HR max	.64*** (n = 79)			
MVPA %	.95*** (n = 78)	.60*** (n = 78)		
SOFIT %	.40*** (n = 79)	.27 (n = 79)	.45*** (n = 79)	
Borg Scale	.17 (n = 78)	.33** (n = 78)	.17 (n = 78)	.00 (n = 78)

**p < .01. ***p < .001

Table 3
Relationship Among Heart Rate Values, SOFIT, and Borg Scale for Boys (Down and Left) and Girls (Up and Right)

	HR mean	HR max	MVPA %	SOFIT %	Borg Scale
HR mean		.72*** (n = 40)	.94*** (n = 40)	.28* (n = 40)	.28 (n = 39)
HR max	.49** (n = 39)		.72*** (n = 40)	−.09 (n = 40)	.38* (n = 39)
MVPA %	.96*** (n = 39)	.40* (n = 39)		.35* (n = 40)	.33* (n = 39)
SOFIT %	.44** (n = 39)	.25 (n = 39)	.49** (n = 39)		−.18 (n = 39)
Borg Scale	.08 (n = 39)	.35* (n = 39)	.06 (n = 39)	.12 (n = 39)	

*p < .05. **p < .01. ***p < .001.

In general, correlations for girls and boys among variables were in the same direction. The notable differences were that girls showed higher positive associations within heart rate measurement than boys and boys had higher positive correlations between heart rate and SOFIT data than girls. Additionally, although maximal heart rate was positively associated with perceived exertion for all students, girls demonstrated a positive and significant association between perceived exertion and heart rate MVPA.

Discussion

The aim of this study was to employ multiple methods to investigate the association among measured, observed, and perceived physical activity. A secondary aim was to assess physical activity levels during elementary PE lessons.

Student heart rate and observational MVPA levels in the present study were found to be considerably lower (35.3% and 41.3%) than the 50% recommendation as an optimal goal for meeting MVPA guidelines in school PE lessons. Although these results are lower than MVPA guidelines, the findings are in line with other studies (Fairclough & Stratton, 2005b, 2006; Stratton, 1996). However, researchers (Jaakkola et al., 2008; Slingerland et al., 2014) whose focus has been on game play have found higher values than the guidelines. This makes us

wonder whether the 50% objective is realistic. PE time is limited, and even the best school PE programs do not deliver enough physical activity during PE lessons to meet overall health-related recommendations. Further efforts are needed to succeed in this, such as providing sports equipment and supervision during breaks, activity in classrooms, and active school transportation, to guarantee that children reach the norm of 1 hr of MVPA every day.

Nevertheless, PE is a valuable foundation of physical activity for children, and one goal is to maintain high physical activity levels during PE lessons. Other goals are to provide students with the knowledge, skills, abilities, and confidence to be active now and throughout their lifetime. Focusing on increasing students' physical activity levels during PE lessons may diminish time spent on other important educational objectives. Lonsdale et al. (2013) concluded that PE teachers could achieve 100% MVPA in their PE lessons by making students run around a field for the duration of the lesson, although this type of lesson will probably not engage students and prepare them for a lifetime of physical activity. One goal for PE is to provide children with opportunities to develop competence in fundamental movement skills that are necessary for participation in games and sports (Stodden, True, Langendorfer, & Gao, 2013). Learning skills in PE requires quality instruction, relevant feedback, and an opportunity to practice (Siedentop & Tannehill, 2000). Therefore, teachers' planning and organization of PE lessons is a key element that must be considered when attempting to optimize practice opportunities to keep students physically active as they develop their motor and sport skills. Teachers can control instruction and provide high physical activity levels during PE lessons (Rink, 2013; Siedentop & Tannehill, 2000) using effective classroom management, task design and structure that provides for maximum participation, and appropriate game modifications.

In addition to low MVPA levels, these students' ratings of perceived exertion showed that they experienced a light degree of physical stress and exercise intensity during PE lessons. Rate of perceived exertion is thought to represent many factors affecting the intensity of physical activity such as students' psychological state and training status and has been used as a simple and valid method for quantifying whole training session intensity for children. The results of this study are in line with previous studies of PE lessons (Marmeleira et al., 2012; Wydra, 2009) but lower than results from boys playing soccer-specific small-sided games (Abrantes et al., 2012). This light intensity during PE may be attributed to Cothran's (2010) conclusion where she reminded teachers that, in contrast to their teachers, students value noneducational aspects (mostly those connected with fun), such as passing grades and spending time and playing with friends.

Boys spent more lesson time involved in MVPA than girls based on heart rate and observation data. These differences in coeducational classes are supported by other researchers' heart rate studies (Fairclough & Stratton, 2005c; Stratton, 1996) and direct observation studies (McKenzie et al., 2004) in PE. Particularly, SOFIT data showed that boys (43.8%) were more active than girls (38.8%). The content and structure of some of the PE activities may not have motivated girls to participate with the same effort as boys.

Even though physical activity makes PE distinctive from other school subjects, its diverse objectives and implementation may conflict with accomplishing recommended physical activity. This topic is also represented in that the data were subject to considerable variance, which was exemplified by high standard deviation values for heart rate and observation data. This variability of physical activity within PE may be noticed on a single student level, when one student showed no MVPA in heart rate data and another student had 71% MVPA during the same lesson. These individual differences are previously described in quantitative (Hannon

& Ratliffe, 2005; Vidoni, Azevedo, & Eberline, 2012) and qualitative studies (Garn, Cothran, & Jenkins, 2011; Griffin, 1984). Another level of variability was the difference between heart rate and SOFIT analyses of student MVPA values, where observational data had higher values than heart rate measurements. This is an important result for further studies because, as Fairclough (2002) noted, heart rate monitoring measures the physiological load and systematic observation measures the quality of movement within PE lessons. However, Fairclough and Stratton (2005a) analyzed MVPA with heart rate measurement and observation and found that heart rate measurement showed higher values than SOFIT, which is contrary to our findings. One explanation may be that Fairclough and Stratton (2005a) obtained SOFIT data from four students' physical activity behaviors, whereas we analyzed all students. Likewise, Verstraete et al., (2007) reported that accelerometer data showed remarkably higher percentages of MVPA engagement compared to SOFIT data. The conclusion is that it is important to report and know how MVPA data are obtained. Fairclough and Stratton (2005a) concluded that evaluations of MVPA data between studies should recognize the differences between what aspect of physical activity has been assessed. In addition, this variation in activity levels reflects the influence of PE-specific contextual and pedagogical factors when comparing differences during these three lessons and the content.

Generally, the associations among variables were in the expected direction. Inconsistencies in the strength of correlations among physical activity measures highlight the benefit of combining instruments when students' physical activity is measured and evaluated. In our study, the SOFIT was used to measure the quality of movement and the heart rate monitors used to assess the physiological response to that movement. The association between them of r = .45 shows that each analysis measured a somewhat different dimension of physical activity. In addition to students' physiological response to movement, heart rate monitors are sensitive to variations caused by emotional changes, which may occur without little or no physical activity. The intermittent nature and the variability in duration and intensity during PE lessons makes matching heart rate to movement more challenging, whereas continuous physical activity may produce fewer errors. However, the correlation among heart rate variables was strong. Girls showed higher correlation between maximal heart rate and both heart rate mean and MVPA compared to boys. A possible explanation for this needs more research. The very strong association (.95) between heart rate mean and heart rate MVPA shows that these variables are almost measuring the same aspect of physical activity. Similarly, Jaakkola et al. (2008) reported a high correlation (.94) between mean heart rate and student time in highest heart rate category (> 160 bpm). Based on our data, it could be possible to set a similar standard for heart rate mean that would be comparable with percentage of time in MVPA. This could be of benefit when using less expensive heart rate monitors. The student heart rate mean in this study was among the lowest compared to other studies (Gao et al., 2009; Jaakkola et al., 2008; Laurson et al., 2008; Sarradel et al., 2011; Van Acker et al., 2010).

Maximal heart rate was not significantly associated with SOFIT, but maximal heart rate was the only variable that correlated with students' rate of perceived exertion. Maximal heart rate is usually defined as the highest value obtained at the end of a test or demanding performance and related to unpleasant feelings for many students. There is probably a logical explanation that students can move a lot, but that is not the same as showing real high effort during a selected moment of the lesson. On the other hand, students' perceptions and memories of how physically demanding a lesson is may more be related to one single moment when they worked really hard and intensely.

Conclusion

Future research assessing children's physical activity may be enriched by using a combination of measurement methods. This would allow a more accurate evaluation of all dimensions of physical activity. If possible, researchers should consider using different methods in their studies. The quality of information produced by combining methods would allow researchers and teachers to design effective interventions to improve activity levels. Such efforts are important as PE may make a significant contribution to students' daily physical activity and well-being. This study is not without limitations, though it has provided relevant and interesting insights to the understanding of students' physical activity during elementary PE lessons. We analyzed only one teacher and his students; therefore, forthcoming work should be focused on increasing the sample size to include more teachers over a wider geographic area. Besides these considerations, the influence of social and cultural factors on student activity may add a new dimension.

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HIV Comorbidities, Treatment, and Physical Activity: Promoting Best Global Practice in Children and Adolescents

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Abstract

Increased global life expectancy has led to a rise in chronic diseases including human immunodeficiency virus/acquired immunodeficiency syndrome (HIV/AIDS). Furthermore, HIV is also on the rise among children and adolescents and is associated with an increased risk for comorbidities such as cardiovascular disease (CVD), diabetes, hypertension, stroke, and depression. The purpose of this paper was to discuss these comorbidities, treatment side effects, and the benefits of physical activity (PA) in individuals who are HIV positive with a focus on children and adolescents. Individuals who are HIV positive also have an increased likelihood for side effects such as hypertension from the treatment options, and these side effects are often associated with an increased risk for CVD and early mortality. Multiple researchers have confirmed that individuals who are HIV positive exhibit lower aerobic functional capacity, as measured by peak oxygen consumption (VO_{2peak}), compared to individuals who are not HIV positive of the same age and gender. Individuals who are HIV positive are also less physically active than individuals who are not HIV positive. These characteristics are especially detrimental in children because chronic diseases are associated with a sedentary lifestyle and increased risk for chronic diseases. Increased moderate to vigorous PA should be promoted in individuals who are HIV positive, especially children and adolescents, to reduce the risk of comorbidities and early mortality and to promote global best practice.

Keywords: *exercise programming; AIDS; antiretroviral therapy; aerobic capacity; cardiovascular disease; renal disease; diabetes*

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Introduction

The increase in global life expectancy has led to a rise in chronic diseases such as cardiovascular disease (CVD), diabetes, and obesity (Alwan, 2011). Obesity and diabetes in particular are on the rise among children and adolescents; they are associated with an increased risk of early mortality (World Health Organization [WHO], 2009). Another chronic disease on the rise among children and adolescents is human immunodeficiency virus (HIV). According to the WHO, more than 30 million people are currently living with HIV/AIDS (acquired immunodeficiency syndrome), with more than 2.9 million of these people being children aged 15 and younger (WHO, 2013). The WHO (2013) estimates that over half a million children who are HIV positive are currently residing in South Africa alone.

The Centers for Disease Control and Prevention defines HIV as "a virus spread through body fluids that affects CD4 cells or T cells of the immune system" (Dias et al., 2013). Over time, without proper disease management, HIV can annihilate enough of these cells and prevent the body from fighting off infections and diseases; the progression of HIV leads to AIDS development. AIDS is considered the final stage of HIV and is clinically documented by blood CD4 or T cell concentration levels at or below 200 cells per cubic millimeter of blood (WHO, 2007). In children, HIV is usually transmitted in utero during pregnancy, during labor and delivery, or through breastfeeding (Dias et al., 2013). The clinical course for AIDS development in children is more accelerated compared to AIDS development in adults. The acceleration seen in children is attributed to the poor development of the immune system (Dias et al., 2013). Most HIV-related symptoms including fatigue, fever, reduced aerobic capacity, enlarged lymph nodes, sore throat, and rash are commonly expressed in children and adults (Definitions, 2007), though other symptoms are comparatively different between adults and children. For example, delayed physical growth and mental development, enlarged spleen, and enlarged lymph nodes lasting 3 months or longer are commonly observed in children who are HIV positive but not in adults who are HIV positive (McComsey & Leonard, 2004; Newell, Borja, & Peckham, 2003; Prendergast, Tudor-Williams, Jeena, Burchett, & Goulder, 2007). HIV is harder to diagnose in children because the antibodies from a mother who is HIV positive may persist in the child up to 18 months after birth, and many of these symptoms (fever, fatigue, diarrhea, persistent/chronic cough, etc.) are often attributed to other common illnesses. These signs and symptoms are more prevalent in children living in developing countries, which further increases the difficulty of diagnosing HIV (Dias et al., 2013) and often delays HIV diagnosis until children begin school (Dias et al., 2013; Prendergast et al., 2007).

Several researchers have documented an inverse relationship between HIV-related symptoms and quality of life. Individuals with higher amounts of documented HIV-related symptoms generally report a reduced quality of life compared to those with fewer HIV-related symptoms (Coleman & Holzemer, 1999). This decrease in quality of life is attributed to the increase in comorbidities and the reduced immune system function commonly observed in individuals who are HIV positive. Because of delayed diagnosis observed in most children who are HIV positive and the increased risk of an underdeveloped immune system, global health practices are important for promoting ways of increasing the quality of life to help this vulnerable population.

Though physical activity (PA) is encouraged in all individuals, becoming physically active is more important for individuals who are HIV positive because of the associated reduction in comorbidity risk to offset the toxic side effects of antiretroviral therapy and the delay in disease

progression. Any increase in PA will also decrease the likelihood of depression symptoms commonly observed in individuals who are HIV positive and improve their overall quality of life. Increasing PA is especially important in children and adolescents to ameliorate the decline in aerobic capacity and the early development of comorbidities such as diabetes, obesity, and CVD (Cade, Peralta, & Keyser, 2002; Lima et al., 2013; Puthanakit & Siberry, 2013). The purpose of this paper was to discuss the comorbidities, treatments and side effects, and benefits of PA in individuals who are HIV positive with a focus on children and adolescents.

Comorbidities Associated With HIV

Multiple comorbidities and physical disabilities are associated with HIV/AIDS including CVD, diabetes, renal failure, reduced aerobic capacity, increased bone fractures, increased fatigue, and malnutrition (Guaraldi et al., 2011). Because CVD risk is increased in individuals who are HIV positive compared to individuals who are healthy (Hand, Lyerly, & Dudgeon, 2009; Hand, Lyerly, Jaggers, & Dudgeon, 2009; Jaggers & Hand, 2014; Sherer et al., 2014), early CVD risk assessment is recommended to implement individual treatment plans for lifestyle changes to reduce overall disease risk (Sherer et al., 2014). The increase in CVD risk is partially attributed to the increase in associated CVD risk factors such as hypertension, diabetes, dyslipidemia, and smoking. These factors are more prevalent in individuals who are HIV positive and are potentially linked to the use of antiretroviral therapy. Additionally, existing evidence links increased stroke risk to individuals who are HIV positive. Women who are HIV positive have also been shown to have a greater risk for stroke and CVD compared to women who are not HIV positive (Chow, 2014). Chow (2014) demonstrated a significant risk for cerebral aneurysmal arteriopathy in young adults and children who are HIV positive.

Guaraldi et al. (2011) reported a greater prevalence of bone fractures in individuals who are HIV positive compared to controls with individuals who are healthy across all age groups. This investigative group also reported a higher frequency of renal failure in individuals who are HIV positive and a greater number of noninfectious comorbidities compared to controls with individuals who are healthy. An average of 47% of individuals who are HIV positive over age 60 had at least two noninfectious comorbidities compared to 19% of patients who are not HIV positive. They suggested that patients who have a longer exposure to HIV also have a higher prevalence of noninfectious comorbidities, and children living with HIV are no exception. Because of the increase in life expectancy, children who are HIV positive will likely live with HIV for multiple decades, which could result in an increased prevalence of noninfectious comorbidities. Furthermore, patients with HIV also have higher levels of chronic systemic inflammation, reduced vascular endothelial reactivity, and more endovascular hypercoagulability. Longer exposure to increased chronic inflammation is a predominant factor for the increased prevalence of noninfectious comorbidities. Guaraldi et al. also suggested premature aging as another factor for increased comorbidities in patients who are HIV positive. Because children are presenting with HIV at such an early age, the need to encourage PA to reduce noninfectious comorbidities and reduce the likelihood for chronic disease is great.

Goulet et al. (2007) completed a study of comorbidities in veterans who were HIV positive and with veterans who were not HIV positive. They confirmed the findings of other researchers, showing an increased prevalence of comorbidities in individuals who are HIV positive; however, they also found that the prevalence of comorbidities varied by HIV status such as HIV-positive asymptomatic, HIV-positive symptomatic, and AIDS. In addition, they found that

older veterans who are HIV positive are more likely to have a substance abuse problem, which further increases the risk for multiple comorbidities and early mortality.

Goulet et al. (2007) also found bipolar disorder and depression as being more prevalent in veterans who are HIV positive compared to veterans who are not HIV positive. However, schizophrenia and post-traumatic stress disorder are more common in veterans who are HIV positive. These findings confirmed that age is correlated with increased mortality when associated with HIV infection (Goulet et al., 2007; May et al., 2006). Kilbourne, Justice, Rabeneck, Rodriguez-Barradas, and Weissman (2001) showed similar results in psychological comorbidities and substance abuse. This investigative group reported that individuals who were HIV positive expressed more depression symptoms and were more likely to report drug or alcohol abuse compared to individuals who were not HIV positive. Substance abuse varied significantly within age groups, and younger patients were more likely to report current drinking and drug use compared to older individuals who are HIV positive. Goulet et al. also reported that certain comorbidities are more common with specific blood CD4 counts in individuals who are HIV positive. For example, vascular, pulmonary, and renal diseases are associated with low CD4 count. This association suggests that these comorbidities are related to or are exacerbated by a low CD4 count. On the other hand, hypertension is associated with high CD4 levels. Several other scientists have confirmed this finding, which is likely related to toxicity from treatment (Goulet et al., 2007; Seaberg et al., 2005). With children who are HIV positive beginning treatment earlier in life, the need to control treatment-related side effects such as hypertension is necessary. The control of side effects is particularly important with hypertension because the long-term complications from uncontrolled hypertension result in increased stroke and CVD risk (Goldstein et al., 2011). Unfortunately, increased diabetes risk has also been seen in children and young adults who are HIV positive (Hazra, Siberry, & Mofenson, 2010).

Another common issue in children and adolescents who are HIV positive is low bone mineral density (Lima et al., 2013; Puthanakit & Siberry, 2013). Puthanakit and Siberry (2013) suggested the prevalence of low bone mineral density in adolescents who are HIV positive is highly associated with financial income. In higher income settings, low bone mineral density prevalence is estimated at approximately 10%, whereas in middle-income settings, prevalence is between 24% and 32%. This stark difference is explained by better nutrition and greater access to HIV-positive treatment options in the higher income settings. Though bone mineral density increases during the growth process in children who are HIV positive, this increase does not occur at nearly the same rate as that observed in children who are not HIV positive of the same age and social status (Lima et al., 2013; Puthanakit & Siberry, 2013). Lima et al. (2013) confirmed this finding and reported adolescents who are HIV positive have a lower bone mineral content compared to children who are not HIV positive. Lower bone mineral density and bone mineral content are likely to continue into adulthood and are detrimental to bone health because these conditions lead to an increased risk for osteopenia and early onset of osteoporosis. Lima et al. recommended increased daily PA, especially using weight-bearing activities, and a modified nutritional intake of calcium and vitamin D to increase bone strength.

Reduced Functional Aerobic Capacity

Most exercise-related interventions measure cardiorespiratory fitness as a common practice prior to low- or moderate-intensity exercise intervention. As a result, substantial data exist that consistently show a reduced aerobic functional capacity among people (adults and

children) living with HIV/AIDS (Cade et al., 2002; Dolan et al., 2006; Hand et al., 2008; Jaggers, Dudgeon, Blair, et al., 2013; Oursler, Sorkin, Smith, & Katzel, 2006; Perna et al., 1999; Rojas, Schlicht, & Hautzinger, 2003; Terry et al., 2006; Thoni et al., 2002). Participants' mean peak oxygen consumption (VO_{2peak}) from these studies is presented in Table 1. Reduced aerobic functional capacity is also associated with a lower cardiorespiratory fitness, as measured by VO_{2peak} (Nelson et al., 2007). Researchers have consistently found in their epidemiological longitudinal studies that a lower cardiorespiratory fitness level is a significant indicator of chronic diseases and all-cause mortality (Boutelle, Murray, Jeffery, Hennrikus, & Lando, 2000; Church et al., 2002; Hand et al., 2008; McAuley et al., 2014; Neidig, Smith, & Brashers, 2003; Nelson et al., 2007; Sui et al., 2013; Terry et al., 2006). However, whether this reduced functional aerobic capacity is due to lifestyle factors or disease-related pathologies is not well understood. Most likely, this deterioration in functional aerobic capacity is multifaceted and encompasses modifiable and nonmodifiable factors.

Table 1
Evidence of Reduced Aerobic Capacity Among Adults Who Are HIV Positive

Author	Mean VO_{2peak}
Hand et al. (2008)	30.5 ml-1*kg/min
Thoni et al. (2002)	25.2 ml-1*kg/min
Terry et al. (2006)	32.0 ml-1*kg/min
Dolan et al. (2006)	16.9 ml-1*kg/min
Rojas et al. (2003)	23.7 ml-1*kg/min
Oursler et al. (2006)	19.1 ml-1*kg/min
Perna et al. (1999)	28.7 ml-1*kg/min
Cade et al. (2002)	26.0 ml-1*kg/min
Jaggers et al. (2014)	19.9 ml-1*kg/min

Modifiable risk factors for chronic disease and all-cause mortality exist in all populations across race and gender. Already having a preexisting condition, such as HIV, makes proper daily lifestyle choices more important. On the other hand, the psychological consequences often associated with a life-threatening illness, such as depression or anxiety, may reduce a person's desire and self-efficacy to be physically active. Reductions in PA often lead to long-term sedentary behavior, resulting in reduced cardiorespiratory fitness and functional aerobic capacity (Mitchell, Pate, & Blair, 2012; Santos et al., 2012).

Researchers have reported significant improvements in VO_{2peak} and reductions in submaximal heart rate within 6 weeks of starting a prescribed moderate-intensity exercise program (Hand et al., 2008; Hand, Lyerly, Jaggers, & Dudgeon, 2009). Hand et al. (2008) provided evidence that supports that adults living with HIV/AIDS can reverse indications of reduced functional capacity, even when they meet less than half of the Surgeon General recommendation of 150 min per week. This data provided additional support for cardiovascular adaptations, such as a reduced resting heart rate and training bradycardia after starting an exercise program (Hand, Lyerly, Jaggers, & Dudgeon 2009; Hand et al., 2008).

Children and adolescents who are HIV positive also experience reduced functional aerobic capacity (Cade et al., 2002; Cade, Fantry, Nabar, & Keyser, 2003). Cade et al. (2002) found that

adolescents who are HIV positive have reduced aerobic capacity compared to control groups of individuals of similar age and gender; adolescents who are HIV positive had lower exercise test duration, VO_{2peak}, ventilatory threshold, and peak heart rate. Cade et al. (2003) reported that adolescents who are HIV positive expressed a significantly lower respiratory exchange ratio, which indicated reduced oxidative capacity as a potential cause of the observed reduced aerobic capacity. Researchers in both investigations suggested that this decrease in oxidative capacity is likely due to mechanisms other than physiologic deconditioning. However, other researchers have indicated that the decreased oxidative capacity is reversed with routine exercise training (Hand et al., 2008). A list of additional benefits experienced by adults and children living with HIV who engage in moderate-intensity exercise is presented in Table 2.

Table 2
Benefits After Moderate-Intensity Exercise Training in Individuals Who Are HIV Positive

Variable	Change
VO_{2peak}	Increase
Resting heart rate	Decrease
Body fat	Decrease
Lean tissue mass	Increase
Muscular strength[a]	Increase
Waist circumference	Decrease
Plasma cholesterol	Decrease
Plasma triglycerides	Decrease
Plasma glucose	Decrease
Plasma high-density lipoprotein cholesterol	Increase
Quality of life	Increase
C-reactive protein	Decrease
Anxiety	Decrease
Depression	Decrease
CD4	No change
Viral load	No change

[a]As measured by bench press and leg press.

HIV Drug Treatment and Side Effects

Within the past 20 years, incredible advances in the treatment and medical management of patients who are HIV positive have occurred. Currently, the main mode of treatment involves combinations of drugs used in antiretroviral therapy treatment that have dramatically increased the life expectancy for patients who are HIV positive by more than 15 years (Fang et al., 2007). As more is learned about this disease and new avenues for better medical management are developed, individuals who are HIV positive are more likely to live longer (Nakagawa et al., 2012; van Sighem, Gras, Reiss, Brinkman, & de Wolf, 2010). In fact, Nakagawa et al. (2012) provided evidence that most individuals who are HIV positive may live as long as someone who is not HIV positive. Thus, even children who are HIV positive may live well into their adult and senior life if antiretroviral therapy treatment is started in the early stages of viral infection and the negative side effects from this treatment therapy are properly managed.

Although advances in the treatment of HIV/AIDS have reduced the number of AIDS-related cases and deaths worldwide, the number of newly reported cases of HIV infections has remained relatively stable. Approximately 40,000 new infections are reported every year in the United States (Centers for Disease Control and Prevention, 2006). Since the development of antiretroviral therapy, drastic changes have been observed in the pathophysiology of HIV disease and symptomatology of infection. People living with HIV/AIDS no longer exhibit high rates of muscle wasting or AIDS-related opportunistic infections (Buchacz et al., 2010). Though using antiretroviral therapy medications is an important advance in the medical management of HIV, this therapy has negative side effects that may transgress into the development of other health conditions. Because of the toxic side effects of antiretroviral therapy medications, individuals who are HIV positive may develop increased rates of metabolic disturbances such as abnormal fat displacement (lipodystrophy), primarily in the abdominal region, and increased circulating blood lipids (Buchacz et al., 2010; Thompson et al., 2011; Triant, Lee, Hadigan, & Grinspoon, 2007). These same abnormalities are also known CVD risk factors. As a result, the need for developing global health practices among individuals who are HIV positive to help offset many of these negative side effects and risk factors is great.

The degree at which symptoms and side effects are experienced from antiretroviral therapy medications will vary depending upon the antiretroviral agent included in the patient's pharmacological regimen, the number of medications included, and the specific medication used from each class. For example, nucleotide reverse transcriptase inhibitors are associated with lactic acidosis, lipodystrophy, and hepatic steatosis. However, researchers have found evidence that lipodystrophy is more prevalent among individuals taking a combination of a protease inhibitor and nucleotide reverse transcriptase inhibitors. Both drug classes are known to disrupt metabolic processes and adipocyte mitochondrial function (Reust, 2011; Thompson et al., 2011). Other known antiretroviral side effects include diarrhea, headache, insomnia, nausea, pancreatitis, fatigue, and anemia. Many of these side effects directly inhibit exercise performance and/or adherence to exercise programming. Children being treated with antiretroviral therapy experience the same side effects as adults. Because of their continued bodily developments and the prolonged treatment effects, children are often more vulnerable to a greater number of antiretroviral therapy complications (McComsey & Leonard, 2004).

Physical Activity and Exercise for Children Who Are HIV Positive

Like adults living with a chronic condition, children also face extraordinary challenges mentally and physically when battling a chronic illness. As a result, children can expect decreased physical and mental health such as decreased PA levels (Hand, Lyerly, Jaggers, & Dudgeon, 2009; Hand et al., 2008; Jaggers & Hand, 2014; Jaggers et al., 2014; Terry et al., 2006), reduced muscular strength (Dudgeon & Hand, 2007; Dudgeon et al., 2012; Dudgeon et al., 2006), increased psychological disturbances (Dudgeon, Phillips, Bopp, & Hand, 2004; Jaggers, Dudgeon, Burgess, et al., 2014; Jaggers & Hand, 2014; Neidig et al., 2003), and reduced aerobic functional capacity (Dolan et al., 2006; Hand et al., 2008; Perna et al., 1999; Rojas et al., 2003). Each factor will result in a decreased quality of life and poor health outcomes for children and adults. Altogether, these changes are detrimental to health and overall quality of life.

Children living with HIV are no exception to the challenges associated with having HIV/AIDS. Children who are HIV positive exhibit similar reductions in aerobic functional capacity commonly observed among adults who are HIV positive (Cade et al., 2003; Cade et al., 2002). To our knowledge, no longitudinal studies exist that have evaluated the effects of exercise

training in a large sample of children who are HIV positive. After we completed an exhaustive literature search using key words (or combinations thereof) such as *HIV, children, exercise,* and *PA* was completed, we found only one report containing two case studies regarding the effects of exercise training in females who were HIV positive, aged 10 and 17 (Miller, 2007). Two females living with HIV completed a 12-week progressive resistance and aerobic training program. Exercise training sessions occurred twice a week and lasted approximately 1 to 1.5 hr. Each session included aerobic and resistance training. The reported results for these subjects were conflicting. Following the 12-week program, the 10-year-old female saw improvements in aerobic capacity, muscular strength, and percentage body fat. However, the 17-year-old female only saw improvements in muscular strength with no significant changes in percentage body fat or aerobic capacity. Most important, no negative effects regarding immunity or viral load were reported in either case study. These data indicate that PA and exercise training are just as safe for children who are HIV positive as for adults who are HIV positive (Miller, 2007).

Because available scientific literature is lacking in this area, making recommendations regarding the amount PA and exercise intensity in which children with HIV should engage is difficult. Most important, we found no reports of negative consequences to the overall health of adults or children living with HIV after engaging in moderate to vigorous exercise. Thus, our recommendation is that children who are HIV positive should engage in PA and accumulate the current minimum recommendations for children of 60 min per day of moderate to vigorous activity (see Table 3; Janssen & Leblanc, 2010). We also strongly recommend that children who exhibit additional comorbidities or who have progressed to AIDS exercise with caution and under proper supervision.

Table 3
Physical Activity Recommendations for Children With HIV [a]

Exercise considerations	Recommendations
Frequency	Daily
Intensity	Moderate to vigorous, with at least 3 days per week of vigorous. Moderate-intensity activity causes a noticeable increase in heart rate and breathing, and vigorous-intensity activity causes substantial increases in heart rate and breathing.
Time	≥ 60 min per day
Type	Enjoyable and developmentally appropriate aerobic physical activities including running, brisk walking, swimming, dancing, and bicycling.
Special considerations[b]	Due to the risk of infecting others, proper first aid and safety considerations should be followed in the case of accidental blood exposure due to scrapes, cuts, and/or bruises. These recommendations are specific for children with asymptomatic HIV and free of other comorbidities and/or opportunistic infections. Children with symptomatic HIV or diagnosed AIDS should proceed with caution. Supervision with these children is strongly recommended.

[a]Adapted from *ACSM's Guidelines for Exercise Testing and Prescription*, Chapter 8 (American College of Sports Medicine, 2013). [b]Adapted from *ACSM'S Exercise Management for Persons With Chronic Diseases and Disabilities*, Chapter 28 (Hand, Lyerly, & Dudgeon, 2009).

Conclusion

In summary, children, adolescents, and adults with HIV would benefit from engaging in PA because of the associated health benefits and the positive impact PA has on associated comorbidities. Because adults and adolescents who are HIV positive have reduced functional aerobic capacity, PA and exercise are important lifestyle interventions to increase functional capacity and enhance quality of life. Individuals who are HIV positive who participate in PA and exercise programming can ameliorate HIV symptoms and comorbidities. The present minimum recommendations of 60 min per day in children and 150 min per week in adults are the same recommendations that are used for individuals who are HIV positive. Thus, public schools and community organizations should promote PA levels at moderate or vigorous intensities. This lifestyle change, in turn, may prevent long-term consequences of HIV and antiretroviral therapy, thus promoting a higher quality of life and global best practice.

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One Cause, Many Crises: The Kinetic Interpretation of Wellness[1]

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Abstract

Unhealthy lifestyle practices have advanced problems associated with noncommunicable diseases. Many of these have occurred as a result of increased physical inactivity, which has resulted in an energy balance that has led to greater incidence of obesity and overweight. The consequences of physical inactivity have increased the prospect of millions of people dying prematurely and suffering needlessly from hypokinetic behavior-related diseases such as chronic noncommunicable diseases (NCDs). Exercise may play a significant role in preventing and treating such diseases. A world movement known as "exercise is medicine" has emerged (American College of Sports Medicine, 2001). This concept grew out of the realization that exercise has many physiological benefits. Exercise has been known over the years to be of great value to physical health and the promotion of sound health (Otinwa, 2013). Prescribing exercise is the process of designing a regimen of physical activity in a systemic and individual manner. The successful integration of the science of exercise physiology with behavior change principles results in long-term compliance to a physical activity regimen. The goal of the exercise physiologist is therefore to prevent and manage injuries and chronic diseases through lifestyle, exercise, and behavior modification. Otinwa (2005a, 2005b) enumerated essential components in the administration of exercise as medicine: frequency, intensity, duration, mode, and progression. The costs of physical inactivity— the growing cost of medical care and the loss of productivity—weigh heavily on individuals and nations as a whole. Furthermore, obese children and adolescents experience psychosocial implications as they are often viewed as being socially inept, being lazy, and possessing a negative self-image.

Keywords: *physical inactivity; fat patterns; obesity; exercise economic and psychosocial cost; prevention of disease*

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[1]Inaugural lecture of the University of Lagos in the Department of Human Kinetics and Health Education. Republished with permission of the author.

Introduction

The structure of the human body as defined by exercise physiologists comprises (a) fat-free weight, which is made up of bones, muscles, skin, blood, and organs, and (ii) fat weight, which consists of stored and essential fats. These components of the human anatomy function well when food ingested converts potential chemical energy derived from it into chemical and heat energy. If the amount of energy intake equals the amount of energy expended, the body is in a state of energy balance and weight remains stable. This biological nature of human beings has made it necessary for people to engage in physical activity, from birth to death. However, if a person ingests excess food, the extra energy derived is not lost but stored as fat; this leads to weight gain, which often leads to energy imbalance and results in systemic malfunction (Plowman & Smith, 2003).

Energy, like matter, cannot be destroyed but can be transformed from one form to another. Physiologically, physical activity is a major means by which the body maintains equilibrium between energy intake and energy output. Physical activity (PA) is the bodily movement produced by skeletal muscles that results in energy use. This includes occupational, athletic, leisure-time, and routine daily activities such as housework, farming, and brisk walking. These activities require light, moderate, or vigorous efforts and may lead to improved health if practiced regularly (Otinwa, 2010b). Physical activity is also described as the movement carried out with the aim of sustaining daily living and not necessarily for physical fitness attainment; it also requires the expenditure of energy. However, exercise is not synonymous with physical activity. Exercise is a subcategory of physical activity.

Exercise is a form of physical activity that is planned or structured. It involves repetitive bodily movements done to improve or maintain one or more of the components of physical fitness: aerobic capacity, muscular strength, muscular endurance, flexibility, body composition, agility, balance, power, reaction time, coordination, and speed. Conditioning and sporting activities are considered exercise because people generally perform them to improve or maintain physical fitness. Physiologically, exercise is described as a single bout of bodily exertion or muscular activity that requires an expenditure of energy above resting level and generally results in voluntary movements (Otinwa, 2010a; Plowman & Smith, 2003). The activity must be of sufficient intensity, duration, and frequency for a person to achieve wellness. For example, walking to the office or market is physical activity and walking regularly at a constant speed and for a specific duration is exercise. From a physiological perspective, both activities bring about changes. I hope that these definitions have cleared the misconceptions surrounding physical activity and exercise. It is against this background that professionals in the field of exercise physiology, a basic and an applied science, describe, explain, and use the body's response to exercise and adaptation to exercise training to maximize human physical potentials. In this article, I will use *physical activity* interchangeably with *exercise*.

One Cause: Epidemiological Transition to Physical Inactivity

Primordial physical activities have been changing with the advent of civilization and technology (Otinwa, 2012). These changes have been classified into three stages.

The Pre-Agrarian Era

At creation, God's original intention for humankind was that he should enjoy and have total control over all that He created, especially the rich agricultural Garden of Eden. The fall

of man, however, marked the beginning of an altered lifestyle, which required humans to live in caves. At this point, humans were predominantly hunters, food gatherers, and nomads. The prevailing environment was hostile; thus, humans had to be extremely active to survive their constant battles with nature. They naturally developed physical activity skills in hunting, spear throwing, and stalking of animals. People ran because they were forced to run; they were either running after wild animals or were themselves running away from wild animals. Certainly, to cross rivers, the only choice they had was to swim. Other survival skills included walking long distances, running, jumping, swimming, and wrestling. These activities were not organized in any way. The physical activity pattern of humans became a means of producing able-bodied "soldiers," wherein only the toughest and fittest individuals could survive the hostile environment of this era.

The Agrarian Era

Thousands of years later, prehistoric societies developed and human beings started to live in settlements. Along the line, they discovered farming and irrigation and became specialized in producing and exchanging agricultural goods. They learned to domesticate animals, leading to a reduction in nomadic activity and resulting in a stationary way of life based on grazing of animals and planting of crops. People were no longer forced to move as the need to pursue animals no longer existed and food production had expanded. In these societies, games were vestiges of warfare and practiced as sport. This was how certain sports emerged. For example, when hunting and running were no longer useful in their original forms, they evolved as archery and running events. Humankind had finally taken control of the environment and developed a social structure and organization. This marked the evolution of a complex civilization. This era witnessed a reduction in somatic energy expenditure but was marked by an increase in food intake and more time for leisure and relaxation. Leisure activities grew from earlier survival skills and became a form of recreation (McLean & Hurd, 2014).

In Africa, traditional sports such as wrestling contests, games, tribal dances, moonlight plays, and arts were used for purposes such as ceremonies, socialization, and special festivals. In Nigeria, adults had their own forms of physical activities that came mainly from their everyday life pursuits, such as farming, fishing, hunting, pottery, cattle rearing, swimming, canoeing, carving, and cloth weaving. These activities naturally forced the indigenous people of Africa to develop strength and physical fitness. The adults in turn taught their children these physical and occupational skills through role-playing and imitation, especially skills needed for adult living and survival. It was the belief that the occupational skills taught to the children were good enough for their physical growth, which in turn would help them in games and play activities (Engstrom, 2004; Otinwa, 2012).

The Post-Agrarian Era

Civilization has forced rapid social changes on humankind in all spheres of life. One of the major social changes was the gradual transition from pre-agrarian daily living that contained high levels of somatic energy expenditure to an increasingly sedentary lifestyle in the modern era. Despite a looming energy crisis, a marked decrease in physical activity has occurred through industrialization, computerization, communication, transportation, and urbanization. This does not exclude improved technology such as automobiles, elevators, electric household appliances, and power tools that almost everyone is using (Otinwa, 2012).

Over forty years ago, Drucker (1973) observed,

> In technologically advanced countries a large number of people who once worked with their hands are shifting over to work that they do with their minds, almost without direct contact with materials and tools.... In 1900, 18 out of 20 Americans earned their living by working with their hands, 10 of those 18 as farmers. By 1956, more than half of the work force had put on white collars. By 1956, only 5 out of 20 are in a vastly larger work force - did manual work, and only one worked on the farm. (pp. 15–23)

Today, in many homes, factories, and offices, machines supply the power for most work. Machines have virtually eliminated the necessity for extensive walking, running, lifting, or climbing in some countries. For example, television holds people in captive idleness for an average of 22 hr a week. Other forms of electrical devices are able to perform work so extensively and rapidly that the use of the musculoskeletal systems of the human body has been greatly diminished. Therefore, for many people, the task of daily living does not provide enough vigorous exercise for them to develop and maintain a satisfactory level of cardiovascular fitness, good muscle tone, or the recommended body weight. Inactivity combined with poor personal health practices such as poor diet on the part of many people could pose massive physical fitness problems.

Prevalence of Physical Inactivity

Today, hypokinetic diseases have become common globally. Physical inactivity is a public health concern for all people, but people with disabilities are at much greater risk of the serious health problems associated with physical inactivity. The health issue of physical inactivity is universal and does not exclude developing countries. Indeed, increasing levels of physical inactivity are being seen worldwide, in high-, low-, and middle-income countries (World Health Organization, 2012). Globally, around 31% of adults aged 15 and older were insufficiently active in 2008 (men 28%, women 34%). Approximately 3.2 million deaths each year are attributable to insufficient physical activity. This status was found to be highest in the World Health Organization (WHO) Region of the Americas and the Eastern Mediterranean Region. In all WHO regions, men were found to be more active than women, with the biggest difference in prevalence between the two sexes in the Eastern Mediterranean. This is the case in nearly every country. Physical inactivity is the fourth leading risk factor for global mortality (6% of deaths globally). It is estimated as the main cause for approximately 21% to 25% of breast and colon cancers, 27% of diabetes, and approximately 30% of ischemic heart disease burden (Otinwa, 2009a, 2010a, 2012).

In Africa, Abubakari et al. (2009) completed a pooled meta-analysis and found that 13% of West African populations were inactive. The pooled physical inactivity in African women was higher than in men, this being contrary to the claim that African women are more active than African men. The estimated combined inactivity was 18% in urban populations and 9.0% in rural populations. Otinwa (2008c) affirmed that in Africa and other developing countries, an acute transition is occurring from their traditional ways to a westernized or modern-world lifestyle. This transition is seen, for example, in the high-calorie fast-food diet and lifestyle of urban dwellers in emerging megacities such as Lagos and Port Harcourt. There are only a few research studies on the physical activity patterns of Nigerians, but Nigerians have historically been physically inactive, and this inactivity is still common today in many urban settings in Nigeria. The prevalence of physical inactivity has increased with urbanization and with the increasing socioeconomic status of citizens.

There is strong evidence to show that physical inactivity worsens the health condition of people with major noncommunicable diseases and shortens life expectancy (Lee et al., 2012). Although the benefits of exercise and the harm of physical inactivity may seem like two sides of a coin, the benefits message emphasized so far has not worked well for most people. For example, in the case of tobacco control, doctors would not usually emphasize the benefits of not smoking, but the harm of smoking. However, credible global and national agencies indicate through their data that emphasis should be on the harm of inactivity, not merely the benefits of physical activity (Otinwa, 2011d, 2013; Wen & Wu, 2012;).

Fat Patterning and Obesity

Energy Equation and Body Weight

Energy balance has been a central selective force throughout human evolutionary history. Obtaining dietary energy and nutrients from the environment traditionally required an expenditure of somatic energy through human movement. Energy balance is the integrated effects of diet, physical activity, and genetics on growth and body weight over an individual's lifetime (Katzmarzyk, 2010; National Cancer Institute, 2014).

Energy intake (E in) from food nutrients is provided by proteins, carbohydrates, and fats; the highest caloric supply comes from fat. Energy output (E out) represents the total energy expenditure, which comprises basal metabolic rate (BMR), physical activity, and the thermic effect of food (Titchenal, 1988). There are three dimensions of energy balance:

- Equilibrium energy balance occurs when caloric intake of food approximates the calories expended; weight is therefore maintained:
  E in = E out Weight balance
- Positive energy balance is when caloric intake is greater than the calories expended:
  E in < E out Weight gain
- Negative energy balance is experienced when caloric intake is less than the calories expended:
  E in > E out Decrease in weight

Unbalanced Equation

A positive energy balance results in overweight or obesity. These conditions indicate body weight that is greater than what is healthy. Both conditions are determined by body mass index (BMI), which expresses the relationship between an individual's weight in kilograms and height, that is, weight/height^2. An individual is considered overweight when BMI value is between 25 and 29.9 kg/m^2, and an obese person has a BMI value of 30 kg/m^2 and above. The difference between the two conditions is the level of risks associated with diseases. However, an individual may be overweight and be healthy because of muscular hypertrophy. This condition is common among athletes. Obesity is a condition in which a person has an abnormally high and unhealthy percentage of body fat; this is harmful to the body.

Fat Patterning

Fat storage varies among individuals. In general, fat distribution is in android, gynoid, or intermediate patterns. These patterns may be found in males and females, although a self-specific dominant is associated with android and gynoid patterns.

Android pattern. The android pattern, also known as the abdominal or apple pattern, is characterized by the storage of fat in the nape of the neck, the shoulder, and the abdomen (upper part of the body). In this pattern, the largest quantity of fat is stored internally, not subcutaneously. The result is the classic potbelly shape.

Gynoid pattern. The gynoid pattern, also called the gluteal-femoral or pear pattern, is found predominantly among females. It is characterized by the storage of fat in the lower part of the body, specifically in the thighs and buttocks, with the largest quantity being stored subcutaneously. No pseudo hardness is apparent. These sites of fat storage tend to be soft and jiggle.

Intermediate pattern. In the intermediate pattern, fat is stored in the upper and lower parts of the body, giving a somewhat rectangular cubic appearance. Abdominal fat deposits are easily mobilized; therefore, it is relatively easy to reduce fat accumulation in this area. Conversely, gluteal-femoral fat deposits are not easily mobilized, and so it is not as easy to reduce fat accumulation in these areas. The potential for reshaping the gluteal-femoral fat pattern is limited (Otinwa, 2011b).

Global Status of Overweight and Obesity

From the perspective of an exercise physiologist, the immediate effects of inadequate physical activity are overweight and obesity. These conditions are increasing at an alarming rate throughout the world. The increasing prevalence of overweight and obesity across the globe has aptly been described as the obesity epidemic. Today, it is estimated there are more than 300 million obese people worldwide. Physical inactivity has resulted in at least 2.8 million people dying each year because of being overweight or obese. The prevalence of obesity is worldwide, affecting men, women, and children. Many countries have experienced a startling increase in obesity rates over the last 10 to 20 years. Over the past decade, obesity levels have increased an average of 10% to 40% (Otinwa, 2009a).

The World Health Organization (WHO, 2006) indicated in global projections that 1.6 billion adults (aged 15 and older) were overweight in 2005 and at least 400 million adults were obese. By 2015, approximately 2.3 billion adults will be overweight and more than 700 million will be obese. At least 20 million children under age 5 years were overweight globally in 2005. In 2010, more than 40 million children under age 5 were overweight. Even though overweight and obesity were once considered a high-income country problem, they are now on the rise in low- and middle-income countries, particularly in urban settings. Close to 35 million overweight children are living in developing countries and 8 million in developed countries. Overweight and obesity are linked to more deaths worldwide than underweight. For example, 65% of the population of the world live in countries where overweight and obesity kill more people than underweight (this includes all high-income and most middle-income countries). The growth in the number of severely overweight adults is expected to double that of underweight by 2025.

The U.S. Department of Health and Human Services (Centers for Disease Control and Prevention, 2007) presented data of the National Health and Nutrition Examination survey that showed that the national percentage of overweight or obese adults aged 20 years and older rose from 56% in the 1988–1994 survey to 64% in the 1999–2000 survey. In 1999–2000, 27.5% of men were obese, and by 2009–2010, the prevalence had increased to 35.5%. Among women, 33.4% were obese in 1999–2000 with no significant change in 2009–2010 (35.8%). In 1999–2000, the prevalence of obesity was higher in women than in men. At present, obesity

and overweight have reached epidemic proportions in the United States. U.S. President Barack Obama (as cited in Ogden, Carroll, Kit, & Flegal, 2012) noted, "As a nation, our greatest responsibility is to insure the well-being of our children." He further suggested, "By taking action to address the issue of childhood obesity, we can help America's next generation reach their full potential."

Tremblay and Williams (2000) reported dramatic increases in the prevalence of obesity among Canadian children. Torrance, Hooper, and Reeder (2002) specifically found the prevalence of obesity in Canada increased substantially between 1979 and 1992 and across all educational levels. The prevalence and increasing incidence of obesity also seems to cut across socioeconomic status, level of education, age, and level of development of the population (Caterson & Gill, 2002; Fontana et al., 2007; Fouad, Rastam, Ward, & Maziak, 2006). In England, the prevalence of obesity has doubled since 1980. Based on current trends, the levels of obesity will continue to rise unless action is taken now. In a study of a Syrian population, Fouad et al. (2006) found that 36.9% of the males and 27.7% of the females were overweight and 28.8% of the males and 46.4% of the females were obese. They further reported the prevalence of obesity among women to be 38.2% higher than that of men.

Furthermore, obesity is no longer just a concern for developed countries; it is becoming an increasing problem in African countries. By far, the largest regional percentage increase in population by 2050 will be in Africa, whose population is expected to at least double from 1.1 billion to about 2.3 billion. The implications for obesity health problems will increase if appropriate measures are not taken (Otinwa & Owolabi, 2008). In a meta-analysis of 16 lifestyle studies in Africa, 13 were on Nigerians and three on Ghanaians. The prevalence of physical inactivity was between 25% and 57%. One researcher reported much higher prevalence of physical inactivity in women compared to men. Diabetes seemed rare at 0.2% in urban Ghana in 1963 and 1.65% in urban Nigeria in 1985. For each study in the two countries, obesity was approximately 4 times higher in women than men (Otinwa, 2010b).

Krugger, Venter, Vorster, and Margetts (2002) conducted a study on obesity levels among Black women in South Africa and found that BMI was positively associated with household income in their study sample. In developing countries, income is positively associated with intake of fat and animal protein foods. Total energy and fat intakes in this study were associated with income level, which indicates that factors other than dietary intake but associated with income level, such as physical activity level, may be more important determinants of BMI. Mean household income was also positively associated with other indices of obesity. The high prevalence of obesity in groups of low socioeconomic status has been attributed to a more tolerant social climate toward obesity. This perception could motivate people to adopt lifestyles that make them fat to attain "societal recognition."

In younger populations, the physical activity levels of children and adolescents are attracting more research attention largely because of the changing lifestyles that have threatened the opportunity to be active and introduced attractive sedentary alternatives. Researchers have found that children and adolescents have become less active to a point where it is seriously damaging their current and future health (Fox & Riddoch, 2000; Otinwa, 2009a, 2010a). Increasingly, children are at risk of well-known consequences of excess weight (e.g., heart disease and diabetes; Beaulieu, Butterfield, & Pratt, 2009).

Culturally, in Nigeria, overweight and obesity are socially accepted as evidence of good living and a sign of affluence and riches. This physical condition is considered aesthetically pleasing. In certain cultures, such as in Cross River and Akwa Ibom states, young women being

prepared for marriage customarily go into the fattening room to eat starch. After marriage, the women are expected to assume a round figure by gaining weight because of their new marital status. Similarly, men are expected to become potbellied. Socially, the bigger the body frame, the more the respect these people have earned. Such people are also given appellations such as *orobo*, indicating a more tolerant social climate toward obesity. However, these traditional views about fatness as evidence of good living detrimental to health, as excessive body fat is a major precursor to many serious cardiovascular and health-related problems. Surveys conducted among urban women in Nigeria show prevalence of overweight and obesity (Adeogun, 2011; Otinwa, 2002a, 2005a, 2008b, 2009a; Otinwa & Adefaraka, 2006). The above health conditions have no doubt affected the life expectancy of Nigerians.

Health Consequences of Physical Inactivity: Noncommunicable Diseases

The world is faced with the prospect of millions of people dying prematurely and suffering needlessly from hypokinetic behavior-related diseases such as chronic noncommunicable diseases. These diseases are the leading causes of mortality worldwide, representing 60% of deaths. In 2011, the United Nations Secretary-General Ban Ki-Moon (2011) focused the world's attention on the growing impact of communicable and noncommunicable diseases in low- and middle-income countries. In regions where infectious diseases are still common, cardiovascular diseases, diabetes, chronic respiratory diseases, and cancer are rising at an alarming rate. These diseases are gradually putting pressure on health care systems, and with the increasing urbanization that Nigerians are currently experiencing in cities such as Lagos, Port Harcourt, and the Federal Capital Territory, Abuja, this situation will only accelerate the strain. In a major policy initiative of the United Nations, Secretary-General Ban Ki-Moon drew attention to the fact that 3 out of 5 people on earth die from noncommunicable diseases.

Out of 35 million people who died from chronic diseases in 2005, half were under age 70 and half were women (WHO, 2012b). Currently, these chronic diseases are steadily growing and approximately 17 million people die prematurely. This invisible epidemic is an underappreciated cause of poverty and hinders the economic development of many countries. Statistics show that the incidence of noncommunicable diseases is increasing in Nigeria. About 15 million Nigerians have a stroke yearly; 100,000 new cases of cancer are diagnosed yearly; 8 million Nigerians have hypertension; over 4.8 million Nigerians have diabetes; 15,000 Nigerians are down with chronic kidney failure every year; and over 1 million Nigerians are blind (Fabunmi, 2013).

In earlier studies (Sanya, Akande, Opadijo & Olarinoye, 2008; Ike, 2008), researchers reported that noncommunicable diseases constitute 69% of hospital admission in the University of Ilorin Teaching Hospital and 60.3% in the University of Nigeria Teaching Hospital, respectively. Within the last 5 years, records available at the University of Lagos Medical Centre show that 7.84% of admissions were noncommunicable disease (University of Lagos Medical Centre, 2014). Statistics on noncommunicable diseases in Nigeria are presented in Table 1.

Table 1
Statistics on Noncommunicable Diseases in Nigeria

NCD mortality*

2008 estimates	***males***	***females***
Total NCD deaths (000s)	254.6	285.2
NCD deaths under age 60 (percent of all NCD deaths)	41.5	41.8
Age-standardized death rate per 100 000		
All NCDs	818.2	792.6
Cancers	89.4	98.8
Chronic respiratory diseases	119.0	71.6
Cardiovascular diseases and diabetes	435.9	475.7

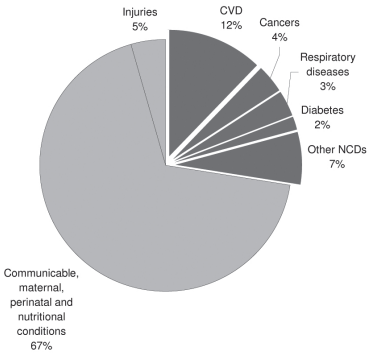
Behavioural risk factors

2008 estimated prevalence (%)	***males***	***females***	***total***
Current daily tobacco smoking	7.6	1.7	4.6
Physical inactivity	...	...	...

Metabolic risk factors

2008 estimated prevalence (%)	***males***	***females***	***total***
Raised blood pressure	41.5	44.0	42.8
Raised blood glucose	6.9	10.0	8.5
Overweight	24.2	29.3	26.8
Obesity	4.6	8.4	6.5
Raised cholesterol	13.6	18.5	16.1

Proportional mortality (% of total deaths, all ages)*



NCDs are estimated to account for 27% of all deaths.

Note. From *Noncommunicable Diseases Country Profiles 2011,* by the World Health Organization, 2012b, Geneva, Switzerland: Author.

The statistics in Figure 1 show the contributory effect of noncommunicable diseases on the projected life expectancy at birth of Nigerians, which is found to be lower compared to that of the world, particularly the less developed world (Population Reference Bureau, 2013). The graphical illustration of Nigeria's life expectancy and population pyramid by gender are presented in Figures 2 and 3. The life expectancy at birth by gender and the world is shown in Table 2.

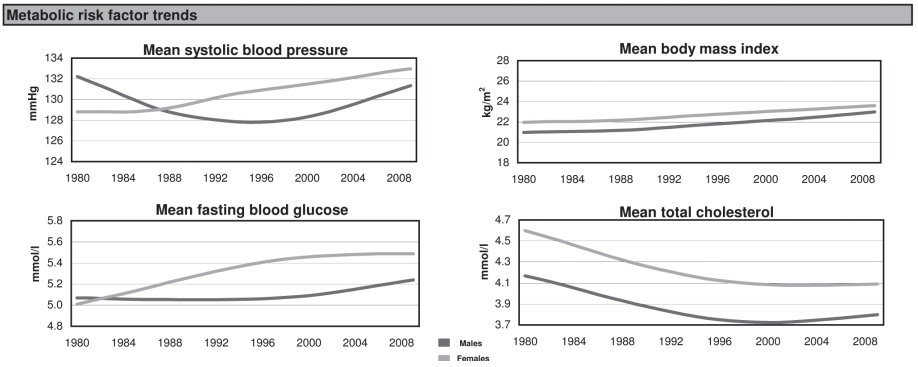


Figure 1. Metabolic risk factor trends. From *Noncommunicable Diseases Country Profiles 2011,* by the World Health Organization, 2012b, Geneva, Switzerland: Author.

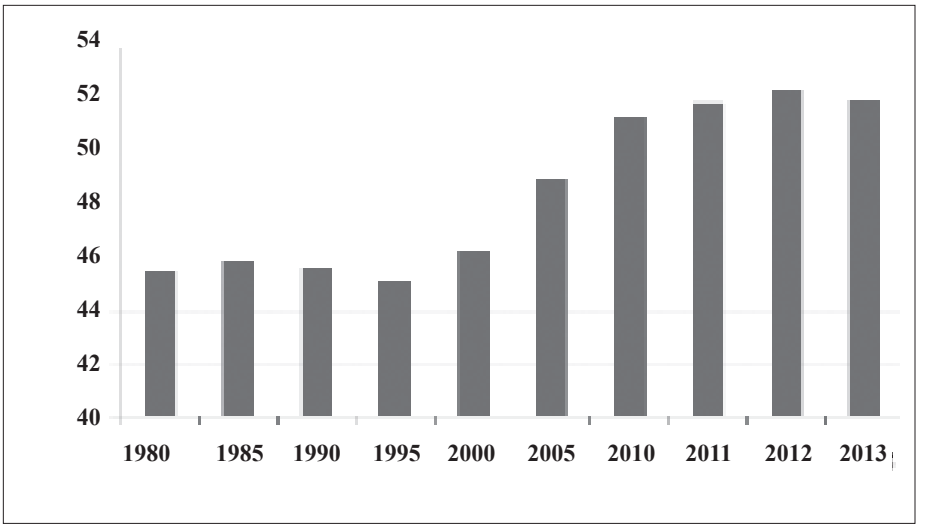


Figure 2. Life expectancy at birth. Adapted from *World Population Data Sheet 2013,* by the Population Reference Bureau, 2013, http://www.prb.org/Publications/Datasheets/2013/2013-world-population-data-sheet.aspx.

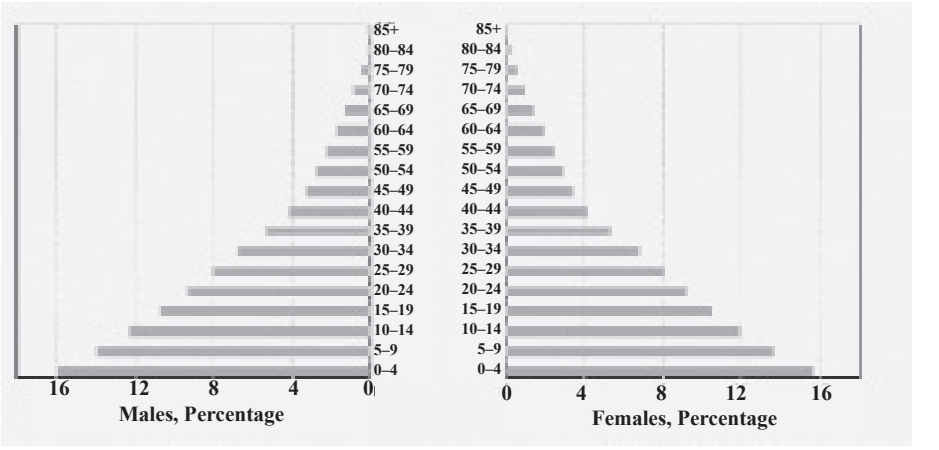


Figure 3. Nigerian 2012 population pyramid. Adapted from *The World Population Prospects: The 2008 Revision,* by the United Nations Population Division, 2009, New York, NY: Author.

Table 2
Life Expectancy at Birth by Gender and the World

S/n	Variable	World (years)	Nigeria (years)
	Life Expectancy at Birth		
1.	Both sexes	70	68
	Females	72	52
	Males	51	53
2.	Population under 15 (years)	26%	44%
3.	Population 65 (years)	8%	3%

Note. Adapted from *World Population Data Sheet 2013,* by the Population Reference Bureau, 2013, http://www.prb.org/Publications/Datasheets/2013/2013-world-population-data-sheet.aspx.

Metabolic Syndrome

Central adiposity is a key feature of metabolic syndrome, reflecting that the syndrome is driven by the strong relationship between waist circumferences and increasing adiposity. Metabolic syndrome is a cluster of health-threatening and lifestyle-related conditions (Otinwa, 2011c). The criterion used to define metabolic syndrome are increased waist circumference, increased triglycerides, decreased high-density lipoproteins cholesterol (HDL-C), increased blood pressure, and increased plasma glucose. Anyone who has three or more of these criteria is diagnosed as having metabolic syndrome (WHO, 2013).

Metabolic syndrome affects 44% of world population older than 50. With respect to that demographic, the percentage of women having the syndrome is higher than that of men. The age dependency of the prevalence of the syndrome is seen in most populations around the world. Excess body adiposity is a major component of metabolic syndrome, a consortium of diseases that have been discovered to later lead to type 2 diabetes, heart diseases, and cerebrovascular accident if not properly controlled and treated (Bakker, Gnasevoort, & Zeeuw, 2007; Kasliwal, Kulshreshtha, Agrawal, Bansal, & Trehan, 2006).

Cardiovascular Disease

Physical inactivity is a predictor of cardiovascular disease and related mortality. The role of physical inactivity in causing cardiovascular diseases is related to increased obesity, which creates a disposition to raised blood pressure and elevated serum cholesterol as well as a greater risk of diabetes mellitus. The most important cardiovascular diseases are related to atherosclerosis, hypertension, and cerebrovascular disorders (Plowman & Smith, 2003). Globally, cardiovascular disease accounts for 13% of the disease burden in adults and approximately half of the deaths caused by noncommunicable diseases, that is, 16.7 million. In developed countries, cardiovascular disease is the main cause of premature death in 38% of men and 44% of women. Furthermore, the mortality and disease burdens resulting from cardiovascular disease are also increasing dramatically in developing nations in general, and this is due to the global epidemic of obesity and metabolic syndrome. In 1999, cardiovascular disease contributed

to one third of global deaths. In low- and middle-income countries, cardiovascular disease contributed up to 78% of cardiovascular deaths. Cardiovascular disease is increasing rapidly in Africa, and it is now a public health problem throughout the region. Worldwide, the prevalence of cardiovascular disease could be attributed to behavioral and physiological risk factors such as inactive lifestyle and inadequate diet. According to the World Health Organization (2006), cardiovascular diseases, overweight, and obesity-related diseases remain the leading cause of death in some developed countries, with higher death rates in females than in males.

Diabetes

Diabetes occurs when the level of glucose or sugar produced from starchy and sugary foods such as rice, cassava, yam, and corn meal is too high in the blood because the body is not processing it properly. Ordinarily, insulin, a hormone produced by the pancreas, ensures that sugar enters the cells to provide the energy needed for day-to-day activities. This hormone also ensures that blood glucose levels remain within acceptable limits. However, when this vital function is not effectively discharged, diabetes sets in. According to WHO (2013), the most common types of diabetes are type 1 and type 2, also called diabetes mellitus. Other forms include gestational diabetes, usually noticed in pregnant women, which could progress into type 2 if not properly managed. Of the two main types, type 2, which afflicts adults, is the more common and accounts for about 90% of all cases. Type 1 affects children.

According to the International Diabetes Federation (2014), over 300 million people worldwide have diabetes, and this number is expected to grow to around 500 million in a generation. Low- and middle-income countries account for 4 out of 5 cases of diabetes. Most deaths and complications related to diabetes in low- and middle-income countries are in the economically productive age group (30 to 50 years). In India, 50.8 million people have diabetes, and in China, 92.4 million people have diabetes. Africa will have the highest percentage increase in the number of people with diabetes over the next 20 years. Eighty percent of people with diabetes in Africa are undiagnosed. Egypt has the highest number of people with diabetes at 7.3 million. In Nigeria, 3.2 million people between ages 20 and 79 live with the condition. Out of the 3.2 million Nigerians with diabetes, about 2.5 million are unaware of their condition.

Cancer

Cancer is presently a major concern in Nigeria. One defining feature of cancer is the rapid creation of abnormal cells that grow beyond their usual boundaries, which may then invade adjoining parts of the body and spread to other organs. Cancers are primarily an environmental disease with 90% to 95% of cases attributed to environmental factors and 5% to 10% due to genetics (Otinwa, 2011a). World Health Organization (2013) statistics show that about 30% of cancer deaths are due to lack of physical activity, overweight and obesity, low fruit and vegetable intake, tobacco use, and alcohol use. It is one of the leading causes of death worldwide, accounting for 7.6 million deaths (around 13% of all deaths) in 2008. The latest world cancer statistics released show that an estimated 14.1 million new cancer cases and 8.2 million cancer deaths occurred in 2012. An estimated 19.3 million new cancer cases will occur every year (International Agency for Research on Cancer, 2013). Lung, stomach, liver, colon, and breast cancer are the most common cancers that result in death each year. Deaths from cancer worldwide are projected to continue rising, with an estimated 13.1 million deaths in 2030. More than 30% of cancer may be prevented, mainly by not using tobacco, having a

healthy diet, being physically active, and preventing infections that may cause cancer (WHO, 2013).

Exercise Versus Drugs as Therapeutic Modifiers in Major Noncommunicable Diseases

There is now a world movement labeled *exercise is medicine* (American College of Sports Medicine [ACSM], 2001). This idea grew out of the realization that exercise has many physiological benefits compared to drugs. Exercise has been known over the years to be of great value to physical health and the promotion of sound health (Otinwa, 2013). Exercise is perceived as a drug that benefits every part of the body and substantially extends life span, yet it seems to receive little attention from many people in society. Exercise is medicine that prevents health problems such as obesity and noncommunicable diseases. The use of exercise as a best treatment for health problems has attracted more collaborative research work in medical practice and exercise physiology. Exercise is more cost effective than drug therapy. In contrast to drug interventions, physical activity is associated with few adverse side effects. Exercise may indefinitely be sustained by the individual, unlike drug treatments, which often have a specified end point. Exercise stands apart from more traditional treatments and therapies in cases such as mental health problems because it could simultaneously improve health and well-being.

Relationship Among Exercise, Body Fat, and Body Weight

Regular physical activity has a positive effect on lipid metabolism and lipid profiles. Aerobic physical activities use the oxygen energy systems that require the mobilization and metabolism of fat storage in the body. Exercise training helps the body manage cholesterol level more effectively. Researchers have suggested through cross-sectional comparison of lipid profiles in physically active and sedentary women that physical fitness is inversely related to total cholesterol (Otinwa, 2008b, 2010b; Despres & Lamarche, 1994; Durstine & Thompson, 2000). Exercise reduces total body fat. Weight-resistance activities stimulate muscular development, preventing significant losses of lean body tissue that generally occur during calorie-restricting diets.

The immediate function of physical activity in an exercise program is to increase the level of energy expenditure. This helps to unbalance the caloric equation so energy output is greater. Exercise increases strength, posture, and balance and decreases falls and resultant fractures. Physical activity also helps people maintain appropriate body weight. It improves appearance and decreases the waistline. Physical activity increases metabolic rate during and after activity. To some degree, regular physical activity contributes to the normal functioning of the feeding control mechanisms of the brain. A sensitive balance between energy expenditure and good intake of such is not well maintained in physically inactive people. Individuals who are physically active are better able to match daily energy intake with daily expenditure.

Exercise and Cardiovascular Health

Regular activity is an important strategy for prevention and rehabilitation of cardiovascular diseases. Active people are at lower risk of cardiovascular diseases, develop fewer cardiovascular diseases, or develop cardiovascular diseases at a later age and tend to have less severe cardiovascular diseases compared to people who are inactive. Exercise of the right type,

intensity, duration, and frequency will cause cardiac adaptation, which is manifested by either a large ventricular cavity that results in increased stroke volume or thicker ventricular wall, leading to a more forceful pumping ability of the heart. Other responses to exercise are increased maximum cardiac output, decreased resting heart rate, increased oxygen use during exhaustive work, and more rapid return of heart rate and blood pressure to resting level following physical activity (Otinwa & Adefarakan, 2006; Otinwa, 1998).

Physical activity may decrease the risk of cardiovascular disease mortality in general and coronary heart disease mortality in particular. Considerable evidence exists that exercise is a means by which high-density lipoprotein may be increased. This increase works against the atherosclerotic process by resisting the movement of low-density lipoprotein into the arterial wall or promoting the efflux of cholesterol from tissues to the liver, where it is broken down and excreted (Hartung, Goreyt, Mitchell, Vlasek, & Gotto, 1989). When people adopt principles of cardiorespiratory fitness, they will experience a positive and tremendous impact on the muscles of the heart, blood vessels, and lungs (Otinwa, 2010b).

Exercise and Diabetes Prevention

Researchers have consistenly reported in epidemiological studies using cross-sectional data that physically active individuals are less likely to develop type 2 diabetes compared to sedentary individuals. When people who do not have diabetes exercise, glycogen from muscles is used first for energy. As they continue to exercise, glucose is taken from other sources, such as conversion of glycogen in muscles and uptake of blood glucose. As blood glucose falls, insulin secretion decreases and glucagon secretion increases. Glucagon facilitates the production of glucose in the liver. If they continue to exercise continues, other hormones, such as epinephrine hormone, growth hormone, and cortisol, begin to play a positive role (International Diabetes Federation, 2014; Otinwa, 2008b).

The joint position statement of the American Diabetes Association and the American College of Sports Medicine concludes that exercise regimens at an intensity of 50% to 60% maximal oxygen consumption (VO_{2max}, 60% to 70% of maximum heart rate) three to four times a week for 30 to 60 min are consistently associated with improvements in carbohydrate metabolism and insulin sensitivity (Canadian Association of Cardiac Rehabilitation, 2000; Otinwa, 2005b). Regular exercise improves insulin sensitivity. This appears to be modulated through an increased number of glucose transporters on the muscle cell surface. There is a clear long-term benefit of improved glycemic control in people with type 2 diabetes who exercise.

Cancer Prevention Through Physical Activity

Researchers of cancer have found that physical activity is associated with decreased breast cancer risk. Physical activity is one of the few known modifiable factors, and increased physical exercise has a key role in primary prevention against breast cancer (Bernstein et al., 1987; Kruk, 2007; Matthews, Fowke, Dai, Bradlow, & Jin, 2004; Otinwa, 2011a; Russell, Mitchell, Musey, & Collins, 1984).

Role of Nutrition in Disease Prevention

Adequate nutrition plays a major role in preventing noncommunicable diseases, especially as it relates to overweight, obesity, and high blood cholesterol. By eating a nutritious diet that

is low in fats, cholesterol, and sodium, individuals lower their susceptibility to heart diseases. Researchers have found that vitamins C and E and fruits and vegetables play a productive role against cardiovascular diseases (Brown, Thomas, & Koteki, 2002; Hartung et al., 1986; Otinwa, 1998). A well-documented change that occurs during dietary restriction of calories is a considerable reduction in resting metabolic rate. This decline may reach up to 40% of resting metabolic rate after a brief time, significantly reducing overall calorie expenditure.

Principles of Exercise Prescription and Compliance

Exercise Prescription

Exercise prescription is the process of designing a regimen of physical activity in a systemic and individual manner. The successful integration of the science of exercise physiology with behavior change principles results in long-term compliance to a physical activity regimen. The goal of the exercise physiologist is therefore to prevent and manage injuries and chronic diseases through lifestyle, exercise, and behavior modification. Each exercise prescription has essential components, which Otinwa (2005a, 2005b) enumerated: frequency, intensity, duration, mode, and progression.

Physical activity is now widely accepted among health and medical authorities as an important factor in healthy living. Furthermore, exercise is considered one of the best options in managing health conditions such as overweight, obesity, cardiovascular diseases, diabetes, and cancer (Otinwa, 2012). Using exercise as medicine, instead of administering drugs, requires designing a regimen of physical activity in a systemic and individual manner. With the successful integration of the science of exercise physiology and behavior change principles, the result is a long-term compliance to a physical activity regimen. This process is prescribed by an exercise physiologist and called exercise prescription. This forms the core area of exercise physiology (ACSM, 2000).

Exercise Dosage

To start an exercise program, especially for adults older than 40, a medical practitioner must complete a detailed medical evaluation of the individual with appropriate diagnostic tools. A careful medical history and physical examination should be focused on the symptoms and signs of disease affecting the eyes and blood vessels, kidneys, and nervous system. If this physical examination is missing, the result may be injury or, in some cases, death, as experienced by individuals who have abused exercise. Exercise dosage for children, adults, and older adults is different, but the same guiding principles are applicable to all age groups and genders (Otinwa, 2011b).

Worldwide, people are becoming more aware of the need to lead an active lifestyle. This calls for providing adequate information and a guide on the basic concepts of exercise to maximize the benefits of an exercise program. People need to adhere to not only a drug dosage but also the exercise dosage that will bring about wellness. Just as a medical doctor prescribes drugs for a pharmacist to dispense, an exercise physiologist prescribes an exercise program for a fitness instructor to administer.

Frequency

The term *frequency* refers to how often exercise should be done. The recommended frequency for exercise is 3 to 5 days per week to achieve optimal gains. The frequency of exercise also depends on the individual's fitness level. Exercise must be performed regularly on

selected days of the week with 1 day of rest in between for muscular recovery. Some individuals think one exercise outing in a week or month brings about a positive change in the body, but it does not work this way (Otinwa, 2002b).

Intensity

Intensity is an indication of how vigorous and hard an individual needs to exercise each day. This is computed through the exercise heart rate, which helps to determine how fast or how hard a person is exercising.

Duration

Duration is how much time a person should spend each day for exercise sessions. From a scientific point of view, exercise durations that have been shown to be most effective are between 30 and 60 min at prescribed exercise heart rate, excluding warm-up and cooldown. To prevent injury, beginners must keep the intensity low and the duration short (ACSM, 2001).

Mode

Mode is the type of exercise and how to perform it. In each session, a combination of aerobics, flexibility, and strength exercises are recommended. For example, when a person selects walking as the main workout, they could walk on a flat surface, hill, treadmill, or stairs or in water.

Progression

Throughout an exercise program, a person must periodically increase the training volume or load progressively to stimulate further improvements. The progression needs to be gradual because doing too much may cause musculoskeletal injuries and is a major reason why individuals drop out of exercise programs (Otinwa, 2010b).

Challenging Barriers to Physical Activity and Changing Needs

Physical inactivity is fueled by several factors. From my interaction with people of different age brackets and research studies conducted among different population groups, the most common challenges cited for not engaging in regular exercise, in order of significance, are as follows:

- lack of time,
- cultural factors,
- social and environmental factors,
- psychological factors,
- history of previous injury, and
- educational and economic factors. (Otinwa, 2012)

Lack of Time

The most common barrier to participation in physical activity is a perceived lack of time. Physical exercise must be considered as important to the body as eating, sleeping, and breathing. Akintunde (1992) reported that women do not participate in recreational sport due to lack of

time and house care work that keeps them occupied after working hours. Research participants explained that time spent on recreational sports could be better spent in other ways as many women prefer other forms of recreation, such as relaxation with family members and watching movies. Unfortunately, time spent watching television is a major risk of cardiovascular diseases.

Cultural Factors

Socialization processes have made girls in particular to be traditionally restricted to the home and kitchen. Thus, women and girls are less active in exercise than men and boys in almost all age brackets.

Social and Environmental Factors

The social and physical environments in which people live may serve as barriers to regular exercise. Socially, being inactive is perceived as normal, and in fact, doctors order patients to remain on bed rest far more often than they encourage exercise. This passive attitude toward inactivity, where exercise is viewed as a personal choice, is anachronistic.

These barriers are community based, and some are individual in nature (e.g., lack of adequate locations for exercise, increased urbanization that has resulted in environmental hindrances such as violence, congested housing, high-density traffic, low air quality, pollution, and lack of parks, sidewalks, and sport and recreation facilities).

Psychological Factors

Many psychological factors influence nonparticipation in regular physical activity among adults. People with a low strong self-image and lack of confidence in their ability to perform exercise are further discouraged to participate because of the fear of injury. I have occasionally witnessed exercise participants who could not walk or run on a treadmill and almost fell down as a result. Other individuals feel shy to join others for an exercise program.

History of Injury

Another factor that serves as a barrier to physical activity is previous history of injury. Once a person has been injured, their likelihood of continuing to be active diminishes. Injuries common to exercise include muscle spasm, ligament tear, and dislocation.

Other factors linked to irregular participation in physical activity include age, gender, and genetics (e.g., sickle cell anemia). Participation in physical activity and exercise tend to decrease across age spans.

Educational and Economic Factors

People with higher educational levels and a more secure financial status participate in exercise programs at higher rates than others. For example, some individuals cannot afford the cost of registration in a gymnasium. The perceived health benefits of regular exercise motivate the literate person.

Economic and Psychosocial Implications of Physical Inactivity

Health crises resulting from lack of exercise and poor attitude toward physical activity have a major socioeconomic impact on individuals, family, and society in terms of medical cost, absenteeism from work, and national productivity.

Economic Cost

The effects and cost of physical inactivity are heavy on individuals and nations as a whole. In addition to the health implications (ACSM, 2001, 2004; Aronne, 2002), physical inactivity

has severe economic implications. Physical inactivity burdens society through the hidden and growing cost of medical care and loss of productivity (Otinwa, 2011e). The World Economic Forum (WEF) has identified noncommunicable diseases as the second most severe threat to the global economy in terms of likelihood and potential economic loss. Noncommunicable diseases are a major cause of poverty, a barrier to economic development, and a neglected global emergency. Statistics from the International Diabetes Federation (2014) show that in 2012 diabetes gulped about $471 billion in health care expenditures across the world.

Birmingham, Muller, Palepu, Spinelli, and Anis (1999) conducted a study on the cost of obesity in Canada and found that about $2.1 billion (2.5%) of health care cost in 1999 was attributed to physical inactivity, with the direct costs of hypertension being $656.6 million, type 2 diabetes being $423.2 million, and coronary artery disease being $346.0 million.

In Nigeria, although the cost implications of the effects of physical inactivity have yet to be computed, it is obvious that the cost is rising because of mortality due to physical inactivity. The volume of human resources lost to hypokinetic diseases in Nigeria has not been quantified. However, many Nigerians have witnessed the deaths of family, colleagues, and friends through hypokinetic diseases.

Psychosocial Implications

Physical inactivity also has psychosocial implications for obese children and adolescents. Indeed, overweight and obese children and adolescents have been known to shun physical activities. They are socially inept, lazy, and possess a negative self-image. Physical inactivity has also been linked with breathing problems (Centers for Disease Control and Prevention, 2007).

The health burden associated with physical inactivity informed most of the research works and the follow-up activities conducted over the last 2 decades. Exercise was used as a tripartite instrument in my research works: as a diagnostic tool in determining the cardiovascular health status of apparently healthy individuals, as a treatment for individuals undergoing rehabilitation, and as a means of preventing hypokinetic diseases and promoting general well-being. These three dimensions have been classified under

- females,
- males,
- young people, and
- athletes.

Females. I gave special attention to women in my research works because of the higher prevalence of body fat and physical inactivity among them. Women generally, because of their occupational choices, tend to differ in social status and life habits. These also seem to influence their leisure-time activities and, consequently, the manifestation and frequency of diseases. Furthermore, women compared to men tend to gain more weight and even lead an inactive life as a result of factors such as pregnancy and resulting challenges of lactation, unhealthy eating habits, and domestic chores. Weight gained by urban females is sometimes difficult to shed. This condition obviously predisposes more women than men to low levels of cardiorespiratory fitness. It is against this background that I focused my research works on women and later on men.

In 2003, Otinwa conducted a cross population study of selected American and Nigerian female adults to compare the cardiovascular health status and body composition of the groups. Participants' body fat percentage and resting values of heart rate, blood pressure, and VO_{2max} were measured. Otinwa used the URHO Kaleva Kekkonen (UKK) Institute's prediction equation to calculate a fitness index based on gender, age, body weight, time taken to walk 2 km, and heart rate recorded at the end of the walk. She found that both groups were overweight and some participants were obese. Although the American participants rated low on the fitness index compared to their Nigerian counterparts, they were better in all fitness variables tested.

In 2004, the University of Lagos Central Research Committee approved a research grant, which was used in conducting a comparative study of the body composition and cardio respiratory fitness of nonteaching university female staff in two universities. Eighty-one nonteaching intermediate level female staff who volunteered and gave consent to participate in the study were screened by a cardiologist and then measured for weight, height, BMI, and body fat percentage.

Results obtained showed no difference in the weight, height, BMI, body fat percentage, resting heart rate, and maximum oxygen consumption between University of Lagos (UNILAG) and Lagos State University (LASU) female staff. Significant differences were observed in age, exercise heart rate, resting systolic and diastolic blood pressures, and fitness index. Both groups rated very low in fitness classification and were found to be overweight and obese. The researchers used an electrocardiograph and found that some participants had systolic hypertension, diastolic hypertension, tachycardia and bradycardia. Participants were advised to change their lifestyle.

To assist the above participants who showed keen interest in improving their cardiovascular health through exercise, Otinwa (2010b) authored the book *Walking for Fitness*. In the book, she explained how people may adopt walking exercise as a simple and an enjoyable means of enhancing physical fitness. She also discussed how, where, and the appropriate materials needed for an effective walking program.

The extract of this book was published and circulated to members of the University of Lagos staff upon the request of the management team of the university during the tenure of a former vice-chancellors, Prof. Oyewusi Ibidapo-Obe. This was an attempt by the management staff to combat the trend of early death as a result of hypokinetic diseases among university staff. Furthermore, the need to improve the projected life expectancy at birth of Nigerians inspired Otinwa (2008a) to write *Achieving a Lifestyle of Wellness*. She highlighted the meaning and dimensions of wellness, the role of physical activities, and nutrition in disease prevention and stress management.

Males. Otinwa (2005b) also measured the maximum oxygen consumption ($V0_{2max}$) of men to determine the capacity of the heart, lung, and blood to transport oxygen to the working muscles and its use during exercise. Although the researcher adopted field methods in the previous research works, she adopted the laboratory method in evaluating the cardiorespiratory endurance of young men. The method is rigorous and not convenient for participants; the attrition rate of participants was high in the study sample. The study assessed the aerobic capacity of healthy African males residing in Cedar Falls, Iowa, United States, using actual and scientific measures of maximum oxygen consumption ($V0_{2max}$). Participants $V0_{2max}$ was determined using a single-stage treadmill walk test. The highest volume of oxygen during 1 min of testing was monitored and recorded as the $V0_{2max}$. Heart rate was monitored and recorded throughout the test. Subjects recovered on the treadmill walking at 2.5 mph on a flat treadmill with facemask

removed until heart rate has returned to warm-up period. The participants rated average on $V0_{2max}$ index and were advised to exercise regularly.

In 2001, Otinwa developed a structured exercise program for rehabilitating drug addicts. The subjects of this study were rehabilitated drug addicts at Adeniji Adele Rehabilitation Centre (Phase II), Lagos. The variables examined in this study were hematocrit, hemoglobin concentration, systolic and diastolic blood pressures, and health-related fitness variables of cardiorespiratory endurance, body fat percentage, flexibility, and muscular endurance, which were affected through the drugs the participants abused. The findings of this study indicated that a 12-week structured exercise program had positive significant effects on hematocrit and resting systolic and diastolic blood pressures (reduced), cardiorespiratory functions, body fat percentage, abdominal muscular strength, and flexibility. Therefore, structured exercise was recommended as part of the rehabilitation process of drug addicts.

Children and adolescents. The physical activity level of children and adolescents is another research dimension that is attracting more attention largely because of the changing lifestyles that have threatened the opportunity to be active and introduced attractive sedentary alternatives. Researchers have found that children and adolescents have become less active to the point where it is seriously damaging their current and future health. Otinwa and Owolabi (2008) compared the anthropometric, central adiposity, and hip adiposity of adolescents in junior and high schools in Nigeria and Botswana. They found that significant differences exist in the BMI, waist circumference, and body fat percentage between adolescents from the two countries. They used their findings for comparative cross-cultural analysis between the cohorts, stating the implications for obesity and recommendations on healthy living, positive active lifestyle, and development of government health policies that could enhance adolescent health.

Athletes. I shifted my research focus to athletes due to the incidence of a sudden collapse and death of athletes during training and competitions as reported by media houses. Notable among these athletes are Kanu Nwankwo, who had heart problems, and Sam Okparaji, who died during an international soccer match. This generated the curiosity to know the status of the cardiorespiratory functions of athletes, especially footballers, because of the premium placed on the sport football nationally and internationally.

Otinwa and Onyeudo (2009) determined the VO_{2max} of Union Bank Football Club of Lagos and examined differences due to positional play. Thirty-five players who volunteered (five goalkeepers, 10 defenders, 10 midfielders, and 10 attackers) were studied. The VO_{2max} of each player was determined using a standard predictive equation. Significant differences were not found among other tested parameters when positions were compared (i.e., goalkeepers, midfielders, strikers, and defenders). However, the goalkeepers (M_{BMI} = 25.96 kg/m^2) were found to have a significantly higher BMI than the rest of the team. The study indicates that position on the field of play has no significant relationship with physiological parameters, such as resting heart rate and maximal oxygen uptake, and that physical characteristics such as BMI have significant relationships with positions played on the field. Otinwa and Onyeudo recommended that training be individualized in team sports in which positional play is emphasized. This is particularly important considering that high-performance skill acquisition is best impacted under such a setting.

In 2013, Otinwa and Azubike assessed the fluid hydration level of selected Nigerian footballers. Adequate fluid hydration prevents heat injury and exhaustion. Some Nigerian athletes have collapsed during competition. This may be due to tropical fatigue and reduction in hydration level. Participants were 30 footballers from Shooting Stars Sport Club of Ibadan,

Nigeria. Data collected include anthropometric measures of body weight, BMI, body fat percentage, lean body mass and visceral fat, resting systolic and diastolic blood pressures, fasting blood sugar test for nutritional status of footballers, and urine test for hydration status. The researchers indicated participants were dehydrated and therefore would need fluid replacement during play to improve performance and prevent dehydration. They recommended athletes should consume an adequate amount of fluid before and at regular intervals during exercise to delay the depletion of glycogen stores and replace water lost in sweat coupled with hot weather conditions.

Current Research

Presently, my colleagues and I are involved in developing a Physical Activity Intervention program in collaboration with HOPSports, USA. This program will provide an opportunity for children to learn sports and movement in the classroom/gymnasium from different countries with different cultures through interactive technology in the cyber world. Moderate- and vigorous-intensity physical activity is being designed to stimulate the cardiorespiratory and muscular responses of children.

Globally, health and physical education programs are faced with the challenge of providing meaningful and relevant learning experiences. Children and adolescents of the 21st century must be able to adapt and adept in critical thinking and problem solving, operate with agility and adaptability, effectively analyze information, communicate in various oral and written forms, reflect greater curiosity, demonstrate imaginative and innovative thinking, and develop healthy and active lifestyles in support of well-being and academic success. Now, more than ever, a broader global perspective of health and physical education pedagogy is needed that is reflective of a world in flux. Without question, knowledge of global practices will assist in advancing health and physical education pedagogy worldwide.

The above justifies for the book *Physical Education and Health: Global Perspectives and Best Practices* (Chin & Edginton, 2014), in which I am a lead author in the chapter "Evolution of Best Practices in the Delivery of Quality Physical Education Programs in Nigeria." Other contributors comprised 109 scholars representing 67 universities, institutions, and schools from 40 countries. The main focus of the contributions include unique curricular models of each country's contemporary and future strategies including technology, teacher–student learning engagement, the structure of classrooms, and the integration of physical education and health in the community.

Conclusion

As an exercise physiologist, I have come to the conclusion that the pursuit of wellness and longevity requires an individual to constantly and deliberately make efforts to stay healthy and achieve the highest potential for well-being. This involves engaging in attitudes and behaviors that enhance quality of life and maximize personal potential. However, though wellness implies working toward a highly developed level of health, it does not mean that an individual will make the best choice in every situation or that perfect wellness is achievable. Wellness emphasizes the need to take responsibility for engaging in behaviors such as active participation in exercise and adequate nutrition that develops optimal health (Otinwa, 2008a, 2009b).

The process of achieving optimal wellness involves balancing and maintaining its essential dimensions: social, spiritual, intellectual, emotional, environmental, occupational, and physical.

Each dimension is equally vital in the pursuit of optimal health, but to an exercise physiologist, physical wellness ranks first and is therefore considered the most important dimension. This is because working to enhance a person's physical wellness contributes to improving other aspects of wellness.

In conclusion, the global epidemic of physical inactivity, overweight, and obesity is a result of an imbalance in dietary energy intake and energy output. The burden of this epidemic condition on the human body has led to many crises, which are manifested in conditions such as metabolic syndrome and cardiovascular diseases exemplified by hypertension, diabetes, and in some cases death. These conditions are preventable. Other social economic impacts include huge medical cost, psychosocial problems, low productivity, and a poor economy.

Researchers have established exercise as a preventive and therapeutic medicine in managing hypokinetic diseases. Therefore, inactive individuals should make a concerted effort to participate in regular exercise programs, which are preferred compared to drug therapy and its adverse side effects.

To improve the life expectancy of Nigerians, which is presently 52 years, Nigerians must rise up and overcome the barriers hindering regular participation in exercise, thereby striking a balance in diet and exercise. Regular exercise is a strong factor in maintaining, preserving, and promoting quality living and longevity. More important, it leads to a healthy and productive life in all aspects of living: academics, sports, labor, and all skills.

Federal and State Interventions

Obesity and related health problems are preventable global epidemics. They result from direct and indirect behaviors of adults. Preventing childhood obesity will require interventions at behavioral, legal, and policy levels extending to the domains of homes, schools, and states that are attuned to the needs and resources of the individual, community, and nation.

Alternatively, a guiding national policy within which the promotion of physical activity is defined as a priority area of action may foster the implementation of physical activity interventions. A guiding policy may be a national action plan or strategy on preventing and controlling noncommunicable diseases and promoting health, physical activity in particular.

Network of Stakeholders

A network of relevant stakeholders (e.g., ministries, private sector organizations, state sporting associations, schools, employers, parents, local community groups) is necessary for implementing physical activity interventions in specified settings (e.g., the community and workplace). Education on the benefits of exercise and the harm of physical inactivity should be publicized through electronic, print, and social media. Additionally, physical education classes should be compulsory in schools from pre-primary and primary to the senior secondary school level, thereby encouraging children to pursue a physically active lifestyle.

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Evaluation, Rationale, and Perceptions Regarding Fitness Testing in Physical Education Teacher Education Programs

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Abstract

Fitness testing in physical education teacher education (PETE) programs is a contentious issue. Some programs have fitness testing, whereas other programs do not, and there is little consensus regarding how and why testing occurs. Therefore, this study sought to investigate the measures used or not used to assess fitness levels of PETE students in 4-year colleges in the United States. A secondary aim was to determine physical education professionals' opinions of the importance of fitness and fitness testing in general. Participants (N = 169) were from PETE degree–conferring programs and completed an online survey in which they were asked to indicate whether they did (n = 106) or did not (n = 63) fitness test, their rationale for or against fitness testing, and the procedures used for those that did fitness test. They also completed a series of opinion questions about fitness testing. Results suggest that fitness testing in PETE programs has increased over the past 5 years, and almost half of the participants said they use fitness testing in their programs for accreditation purposes. However, participants' choice of assessment and passing standards varied, including some who had no passing requirements. A variety of personnel conducted fitness tests, and the requirements for retaking a fitness test differed, where some students were provided with remediation but not others. Participants who elected not to fitness test cited philosophical, ethical, and practical issues associated with testing. Overall, participants were supportive of physical educators being fit at all levels, but less so of fitness testing in PETE programs. We found that testing in its current form may not be achieving its intended purpose and suggested alternatives to current fitness testing.

Keywords: *dispositions; NASPE; health; CAEP; accreditation; liability*

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Introduction

According to Quinn (2011), a fitness test is a measure conducted once or in a series to determine an individual's overall health and physical fitness. Fitness testing is a common practice in public schools and is a mandated requirement in some states (Fitnessgram, 2013). In addition, many physical education teacher education (PETE) programs commonly conduct at least one or more fitness tests during a student's degree program. Staffo and Stier (2000) reported that PETE chairpersons valued physical fitness, yet many did not specifically test student fitness levels. Baghurst and Bryant (2012) questioned the efficacy of currently used fitness tests, suggesting that collegiate students could be better assessed by requiring them to demonstrate the physical requirements of their state's K–12 physical education curriculum. Little consensus remains on why, when, and how PETE fitness testing should be conducted.

Fitness testing for collegiate students majoring in physical education is a controversial topic (Baghurst & Bryant, 2012). Some PETE majors must pass a fitness test to receive a degree in the field per university requirements, whereas others do not. Every several years the *Journal of Physical Education, Recreation, and Dance* (1992, 2001, 2007) addresses this topic in an Issues section.

There are two distinct theoretical standpoints concerning fitness testing in PETE programs. One standpoint is that fitness testing reinforces the logical rationale that PETE program administrators should want their students to not only teach healthy and fit lifestyle habits to their students, but also model them. In addition, modeling health and fitness is an expected standard (National Association for Sport and Physical Education [NASPE], 2014). Conversely, some researchers have suggested that a student's fitness is a societal, not programmatic, problem (Ross, Jones, & Deerness, 2007) and may have liability issues (Baghurst & Bryant, 2012; Staffo & Stier, 2000). Thus, it is important to clearly delineate why these standpoints exist to better understand the rationale of this study. Ross et al. (2007) suggested that fitness testing should address a need, focus on immediate and lifelong learning, be a valuable use of time, and promote a positive attitude toward physical education. Although they made these recommendations toward physical education teachers, the argument could be made at the collegiate level as well. However, whether fitness testing in its current form achieves these aims is unclear. Some programs have fitness testing, whereas others do not, and to date, no researchers have attempted to specifically understand why a program does or does not have fitness testing.

Rationale for Fitness Testing

NCATE, now the Council for the Accreditation of Educator Preparation (CAEP, 2014), requires evidence that PETE students "achieve and maintain a health enhancing level of fitness throughout the program" (p. 1) as part of Standard 2.2. Thus, students meeting expected levels of fitness on a physical fitness test provides evidence toward this standard. The notion of "practice what you preach" applies to many vocational and health situations. Researchers have found that 10% of doctors (Vanphanom et al., 2011) and 11% of nurses (Berkelmans, Burton, Page, & Worrall-Carter, 2011) smoke. Physical educators who teach healthy living and exercise yet fail to abide by their own edicts may discourage students from believing taught content. For example, Melville and Maddalozzo (1988) found that students in health classes that were taught by a teacher who was obese were less likely to remember the content of the lesson and believe what was being taught.

Dispositions include being able to provide a living example of health and fitness as well as developing the skills necessary to administer a fitness test in the future. The importance of dispositions or modeling fitness is supported by O'Sullivan and Tannehill (1990), who stated that physical educators "… have a moral obligation to create experiences that correspond to appropriate images of excellent professional preparation and practice" (p. 182). Simply, PETE students should be expected to learn, teach, and live it (La Vine & Ray, 2006). Cardinal and Cardinal (2001) reported that role modeling was a significant tool in teaching physical education. Thus, if children and teens are being encouraged to make healthy choices and increase their participation in exercise, logically the encourager should be modeling those behaviors (Baghurst & Bryant, 2012). However, whether a teacher chooses to be a role model is irrelevant because they are considered role models even if they do not personally see themselves as such (Good & Brophy, 1973).

Educators have the opportunity to use indirect methods of teaching whereby a developed technique is facilitated rather than controlled (McBride & Cleland, 1998). In the demonstration–replication method of teaching, the teacher presents the material, explains it, demonstrates it, and then expects the students to replicate what was shown. This is particularly relevant and important in physical education where the teacher frequently models the physical skills and activities (Cardinal & Cardinal, 2002). However, such modeling will be ineffective if the teacher is unable to demonstrate a skill or physical activity due to a lack of physical fitness. When teachers personally demonstrate the techniques they are teaching, the students are more likely to understand the techniques and perform them better (Cardinal & Cardinal, 2001), and researchers have found that students score higher on health-related fitness tests if they perceive their physical education teachers to be fit (Dean, Adams, & Comeau, 2005; Thomson, 1996).

Although PETE students are expected to understand the importance of "walking the talk," this expectation cannot be assumed. For example, La Vine and Ray (2006) found that PETE students' physical activity levels were on average below the 10,000 steps per day necessary for healthful living. It was encouraging that participants in the study increased their activity levels following the initial test, and this suggests that fitness tests may serve as an important motivator. Hence, fitness testing not only meets the needs of a standard, but also initiates meaningful change in healthy behaviors.

Rationale Against Fitness Testing

The premise of fitness testing is to ensure that graduating PETE students are able to evidence physical fitness, as students will take an instructor more seriously if they appear capable of exhibiting the concepts they are teaching (Bucher & Thaxton, 1981). Yet Ross et al. (2007) suggested the fitness testing should not be the responsibility of the teacher:

> Performance-based fitness…sends unjust, immoral, divisive, insensitive, and limiting messages to our students…the intent of these activities has shifted to be seen as a means of solving societal problems. Is it the responsibility of physical education, and thus physical educators, to resolve societal dilemmas?

Thus, fitness testing may be a mechanism to address global problems that are not the responsibility of the physical educator. This argument could be applied to PETE programs as well. Are program faculty responsible for determining whether students are fit? Do other accrediting bodies demand standards that are based on physical abilities or appearance? Does

the accrediting body of a dental program require students to demonstrate dental hygiene maintenance, for example?

Fitness testing may also have liability issues (Baghurst & Bryant, 2012). For example, what would happen if students could not graduate because they were unable to pass a fitness test? Litigation has occurred in the past, and collegiate programs appear to be dropping physical activity requirements (e.g., Cardinal, Sorenson, & Cardinal, 2012; Grasgreen, 2012). Two students sued a high school claiming that their rights were violated when they were not awarded diplomas for failing the fitness assessment required by the school (Jerema, 2010). Students at Lincoln University are required to pass a waist measurement and body mass index test if they want to opt out of fitness classes, which has also generated debate (Landau, 2009). Furthermore, Staffo and Stier (2000) found that in 80% of programs with fitness tests, study participants were not required to sign a liability waiver and suggested that programs and testing administrators are at risk of litigation.

Organization and time constraints may play a role in why PETE program administrators elect not to fitness test. The organization of this process could be problematic, particularly as greater workloads and increased stress lead to higher levels of faculty turnover (Ryan, Healy, & Sullivan, 2012). Faculty turnover may require training a new faculty member, which requires additional time and effort.

Last, fitness testing may not be perceived as useful. For example, Keating, Silverman, and Kulinna (2002) reported that PETE majors had only slightly positive attitudes toward fitness testing and did not find it either important or useful. A group of students who are apathetic or even against testing may discourage program administrators from requiring fitness tests. Because students' experiences and expected grade influence teacher evaluations (Ewing, 2012), and students have been found to deliberately misreport their educators on evaluations (Clayson & Haley, 2011), educators may be inclined to avoid situations where tenure and promotion could be negatively impacted.

Purpose of the Study

Baghurst and Bryant (2012) highlighted the current challenges associated with fitness testing:

> [The] diverse form of testing may in part help explain why this issue is so controversial, for it raises many debatable questions. What is the definition of fitness? How fit is fit? What should be the passing grade? What if someone looks fit, but they are not fit? What if someone looks unfit but they are fit? Does a higher education institution have the right to enforce this kind of testing? (p.12)

Current testing methods to assess fitness levels of physical education students vary depending on the university, and not every school uses a fitness test. Therefore, program administrators that test may have "fitter" students, or no difference could exist compared to programs administrators who do not test their students. Furthermore, although fitness testing is becoming an increasingly common practice among PETE programs to meet accrediting standards, some programs may not be accredited and/or administrators may elect not to fitness test. Why they may not is not well understood, and to date, no researchers have attempted to investigate program administrators who do not fitness test. Although fitness testing has raised questions, few researchers have investigated whether it serves its intended purpose of achieving and maintaining healthy levels of physical fitness, as per NASPE (2014) standards. Thus, based

on the current lack of clarity with regard to fitness testing in PETE programs, the purpose of this study was to investigate the differing measures used or not used to assess fitness levels of PETE students in 4-year colleges in the United States. A secondary aim was to determine participants' opinions of the importance of fitness and fitness testing within the physical education profession and determine whether these opinions differed by whether the PETE program was NCATE accredited and by whether administrators did or did not fitness test.

Method

Participants

Participants were 169 individuals at a 4-year institution in the United States with a PETE program in which students could become certified physical education teachers. Programs such as 2-year institutions, kinesiology programs that did not have a PETE program, and programs that did not lead to licensure were excluded from analysis. Participants were solicited from their university website as being responsible for directing the program; however, it was requested that the survey be passed to another if that person was not best able to answer questions (e.g., the person was department head, but did not have a physical education background or did not directly oversee the physical education program).

Two websites (www.A2ZColleges.com and www.petersons.com) were used to develop a master database of PETE programs nationwide. Users may use these websites to search for academic programs by state. Academic institutions that were reported to possess a PETE program were entered into a master list, and the two websites were cross-referenced to check for institutions that may have been overlooked with just one source. The master list comprised 592 universities, and 195 participants representing these programs began the survey yielding a 32.94% response rate.

Participants who indicated their university did not have a PETE program, did not have a program that led to licensure, or did not complete the entire survey were eliminated from further analysis, resulting in 169 usable responses. Participants were not required to identify their institution unless they wanted to opt out of receiving a reminder e-mail or receive synopsis of the results. Almost two thirds of the sample (61.13%) identified their educational institution, and all states were represented. Of those that participated, 106 indicated that they conducted fitness testing in their program, whereas 63 participants indicated that they did not fitness test.

Instruments

The instrument used was an online survey administered through Qualtrics software that contained closed- (Likert-type questions) and open-ended questions. Participants were asked demographic information about their PETE program such as whether the program was NCATE accredited or whether it led to licensure and nonlicensure degrees. In addition, participants completed six questions concerning opinions of the importance of physical educator fitness and fitness testing. These questions were based on a 5-point Likert scale that ranged from 1 = *agree completely* to 5 = *disagree completely*. Cronbach's alpha reliability estimate for the opinion items was .82, suggesting a relatively high internal consistency reliability for this sample (Gall, Gall, & Borg, 2007).

Validity of the instrument occurred in several steps. First, a comprehensive search for a measure addressing the aims of the study was conducted. Second, specific question items were developed using the historical perspectives presented in former research. Third, survey

questions were distributed to three physical education university professionals in support of construct validity. All recommendations were included in the final instrument. For example, one question referred to grade point average as GPA, but it was suggested that an acronym could be misinterpreted, and the wording was altered. Fourth, further validity of survey questions occurred through a pilot study where the input of all educational institutions from one state that met the requirements were surveyed first. The purpose of the pilot study was to assess the efficacy of the survey questions and to fine-tune the procedure process by soliciting feedback regarding the face, format, and content of the survey. No changes to content were made, although minor grammatical issues were corrected. Reliability of the survey using all 169 participant responses yielded a Cronbach's alpha of .81.

Fitness testing participants. Participants were directed to different questions whether they did or did not use fitness testing. For participants that did, questions solicited details of the fitness tests used in addition to how, why, and when fitness testing was conducted. Several questions were designed to include a qualitative response to allow participants to expand on their answer. For example, when asked whether they used a fitness test, those that indicated yes were asked to explain why they had a fitness test in an open-ended response. The survey comprised approximately 25 questions depending on the options selected.

Nonfitness testing participants. Participants who did not fitness test were asked in a qualitative, open-ended question to explain why fitness testing was not conducted. Furthermore, if testing had been stopped at some point, they were asked to explain why. This portion of the survey comprised approximately 12 questions based on selected options.

Procedures

Following institutional review board approval, participants were located by searching each academic institution's website for the person best able to answer the survey. Individuals targeted were those identified as PETE coordinators, although if no such person was evident, the chair or director of the school or college in which PETE was located was contacted. For a small number of schools where it was unclear to whom the e-mail should be addressed, the institution was called and a contact person was acquired. Participants were required to provide consent to begin the survey.

Participants were recruited using best practices (Berk, 2012). For example, each e-mail was individually addressed and sent to the targeted participant rather than sending a generic group e-mail. The e-mail contained content requesting that if the individual targeted was not the appropriate person to answer the questions that it be forwarded to the person best able to respond. A follow-up reminder was sent 7 days following the initial request.

Data Analysis

Analysis of quantitative data to answer the research questions in this study involved descriptive statistical methods in the form of frequencies, percentages, and means and standard deviations of the variables. Two one-way ANOVAs were performed to determine statistical differences between participants' opinions of fitness testing based on whether the PETE program was accredited or not and on whether administrators required fitness testing.

After qualitative data had been transferred to an Excel spreadsheet, two experts independently developed categories based on question responses. Both experts had extensive experience in physical education, sports, and quantitative and qualitative research methodology. Using constant comparative analysis (Glaser, 1965; Morgan, 1993), the experts met to discuss the categories and reach a consensus on the categories for each question. Constant comparative

analysis is also known as coding (Miles & Huberman, 1994; Ryan & Bernard, 2000), and it may be used deductively (codes developed prior to analysis), inductively (codes emerging from data), or abductively (codes emerging iteratively) to identify underlying themes (Leech & Onwuegbuzie, 2007). Thus, for this study's analysis, themes emerged inductively whereby participant statements were independently assigned a category so agreement could be established using a kappa coefficient. Coefficients were all highly agreed upon (i.e., > .90); therefore, the experts did not have to reevaluate and discuss their responses for agreement.

Results

Program Demographics

Although not a requirement, many participants elected to state their institution. Participating institutions were located nationwide. Participants were asked to indicate which kinesiology-related programs were available at their institution, and the responses were varied. Although physical education was the most frequently selected program (169), other popular choices included health education/promotion/science (114), exercise science/physiology (113), sports management/administration (79), and athletic training (76).

With respect to licensure, 70.5% of programs led to licensure and 29.5% had an additional nonlicensure option or route. Of the programs, 70.2% were NCATE accredited, 26.1% were not, and 3.7% declined to answer. On average, 87.2 students (SD = 99.06) were in the program with a range between 2 and 650 students per program. For programs that did not have fitness testing, only 9.5% had a fitness test in the past; most had never had fitness testing (90.5%).

Fitness Testing Respondents

Who is tested and when. Most participants (64.9%) required fitness testing only for PETE majors, whereas the remaining participants (35.1%) required students in other majors to complete a fitness assessment. When asked to identify when students were tested during the program, testing as a senior was the most frequent choice (45%). Students were also tested as juniors, sophomores, and freshman almost as much (39% each). More specifically, participants identified the beginning (36%) and end (35%) of the PETE program as more common than the middle (28%).

In a follow-up qualitative question, participants were asked to indicate why students were tested during these times. Categories derived from the responses included (a) Compliance With Accreditation, (b) Course Driven/Convenient, (c) To Address Concerns, and (d) Other. A kappa coefficient corrected for chance agreement between the two raters was computed (κ = .97).

Testing periods were primarily Course Driven/Convenient (38.55%) and examples included "It is within the curriculum of the course in which it is taught. It generally lands within a student's sophomore year," and "Attaches testing to appropriate courses that are taken at those points in the curriculum." To Address Concerns was the second highest category (28.82%). "Seems like every year our students are less fit so we had a concern for safety in the methods/activity courses and want our students to be more aware about the importance of fitness" and "Allow them to address any fitness concerns identified before using it again at the end of the PETE program" were examples of concerns given.

Compliance With Accreditation accounted for 20% of responses. Participants gave supporting examples such as "To have complete data sets for our NCATE reports and to ensure that our students are remaining fit" and "To fulfill NASPE Program Standard 2." A final category

of Other accounted for 12.63% of responses. This category included items that did not fit in another category or did not provide enough information to be assigned accurately to another category (e.g., "Every student is tested each semester" and "To measure change").

When fitness testing began and changes made. Participants were asked to indicate approximately how long fitness testing has been a requirement in their respective program. Twenty-three percent had only implemented fitness testing within the past 2 years, 39% within 2 to 5 years, 16% between 5 and 10 years, and only 22% for more than 10 years.

Almost half (43.9%) of participants reported having altered the test from its inception. Reasons for altering the test varied, including "As suggestions for fitness testing from the Presidents challenge has changed, we have changed what we include in testing," and "We have used different abdominal tests because the FitnessGram Curl Up test is very unreliable..." Others indicated that testing methods had changed to reflect external standards:

> We initially designed our own test, which was longer and more rigorous than FitnessGram. It was rejected by the reviewers. I consulted with a person familiar with NASPE expectations, and was told that NASPE wanted all programs to use FitnessGram.

However, not all participants appeared concerned with external assessment, as tests changed "Only as the text used changes" or "When a change in instructor happens, the instructor may delete or add a test."

Administrator and test details. Almost half (45.5%) of participants indicated their program had multiple faculty conduct the fitness tests, 36.4% had a PETE faculty member conduct, 4% the PETE coordinator or chair conduct, and only 0.9% had an independent evaluator conduct. Of the participants, 14.1% selected the option of Other and included an additional explanation. These responses were further analyzed, and it was found that half (7.05%) were more specific in their description for one of the prior options available (e.g., PETE faculty), but the remaining 7.05% reported that students conducted the testing.

With respect to tests used, a standardized versus nonstandardized (i.e., self-developed) test was the most frequent response (82%). Participants were asked to indicate the specific form of testing they used. Fitnessgram was the most frequently cited (65.57%), although some used other measures such as the President's Challenge. In addition, some participants reported using a combination of standardized fitness measures from multiple assessment protocols or added assessments such as a body fat measure instead of body mass index to the Fitnessgram, for example. Nonstandardized tests (18%) included "Similar to FitnessGram but we developed our own norms," and "[A] hybrid of different tests of fitness components selected from various batteries."

Passing, failing, and avoiding options. Participants were asked to complete an open-ended response detailing the specific passing requirements for the test. Because of the variety of responses, specific categories were not assigned to these responses. Of participants who set passing requirements, the majority responded about Fitnessgram, as it was the predominant measure used. However, passing requirements differed. For example, one respondent stated passing constituted students passing "3 of 4 FitnessGram tests," another participant said students had to be "above [the] Health Fitness zone," and a third participant stated that students had to "pass 4 out of 5 of the requirements at a proficient level, one at the competent level."

Those who had passing requirements but chose not to use Fitnessgram had several standards specific to their test (e.g., "Standards are varied and 'homegrown' based on data we have collected over the years," and "[We] have over 27 assessments which are done 3 times").

For some participants, students were not required to pass the fitness test. Other than stating that there were no consequences for students failing, participants included responses such as "This is not the purpose of conducting the tests" and "We allow students to pass the class, even if they fail the fitness tests. However, we counsel students of the implications of poor health-related fitness."

Participants also responded to an open-ended question about the options available should a student initially fail the test. Categories derived from the responses were Retake, Retake With Remediation, or Other with high rater agreement ($\kappa = .98$). Retake With Remediation was the most frequent response (49.56%), and example statements included "If a student fails, we remediate. We send them to work one-on-one with a faculty member who has expertise in that area. A plan is developed for improvement over time," and "If the student does not pass the fitness test, the student will be advised to meet with a faculty member to design a physical activity program. The student may re-take the test when ready."

A quarter of the participants (35.78%) did not appear to offer remediation in their programs, but they expected students to retest. For example, one participant reported, "Teacher candidates who do not score at the acceptable level or higher are required to repeat fitness testing each semester until that minimum standard is achieved." Another participant said, "They are allowed to make up the tests as many times as they want to achieve and maintain a health-enhancing level of fitness."

The category of Other (14.66%) had statements that did not fit into the other categories. For many, this was because failing was not an option, and the fitness assessment was used more as an educational tool. One participant reported, "Failing is not an option, everyone passes." Another participant responded, "Students can't fail. Their fitness is their fitness and serves only as information." One participant stated that if students fail, "we counsel them out of the program."

When asked ways to avoid the fitness test, four categories emerged: No Way to Avoid, Medical, Passing Not Required, and Other ($\kappa = .94$). There was no way to avoid the test in most programs (47.61%), but some participants indicated that documented disabilities would eliminate the requirement (18.13%). For other participants, the outcomes were not particularly important (19.54%). "They don't 'fail'... it is just strongly recommended that they do well," "No significant consequences of failing the test," and "Our tests are for student awareness" were supporting statements. The Other category (14.72%) included items that did not fit in the other categories and included examples such as "Still in the planning stages" and "No other avenue; however, some students who are on the cross country team are waived from doing the Cardio test."

Why fitness test. In a qualitative question, participants were asked to indicate why students were tested at all. Categories that emerged from the responses ($\kappa = .93$) included (a) Accreditation Purposes, (b) Professional Dispositions, (c) Educational, and (d) Other.

Accreditation was the primary reason (42.86% of responses) for fitness testing, and supporting responses included "Required by NASPE standards," and "Because we use it on our NAPSE NCATE report!" Dispositions were also an important reason for participants (23.47%); participants supported with statements such as "Our undergraduate students 'represent' young professionals in the field, and it is important to look and act the role," and

> Because we believe that our PETE students should meet health-related criteria for physical fitness in order to be good role models. If they don't live the message of personal fitness and wellness, how can they sell that message to their students?

The test was also perceived as Educational (21.43%). One participant responded, "To teach them how to administer the fitness tests themselves." Another participant said, "They have gone through the test battery and know what it feels like to be on the other side." The Other category accounted for 12.24% of responses such as "Aerobic fitness" and "Our students are fitness tested each semester," which were judged to not fit in other categories

Nonfitness Testing Participants

In an open-ended question, participants were asked to explain why they chose not to fitness test students within PETE programs. Categories agreed upon included Philosophical/Ethical Issues, Testing Issues/Constraints, and Other. Philosophical and Ethical Issues (61.2%) included statements suggesting that testing was unnecessary or may result in legal ramifications from requiring a test (e.g., "It is not a criteria we feel as important at this time," "Exclusionary, what purpose does it serve?" and "We changed policy several years ago—legal ramifications").

Measurement and Testing Issues/Constraints (20.7%) were also cited and included the belief that the testing was too difficult to accomplish. For example, one participant stated that it was "too cumbersome." Another participant stated, "At a research institution the program does not have the time for fitness testing of students."

An additional category of Other (18.1%) comprised statements that could not fit into either of the other categories, in part because some responses lacked enough information to explain why fitness testing was not conducted. Examples included statements such as "It is not required," "We are in the process of developing fitness testing for our students," "It was never done," and "Are you kidding, NEVER will this happen with our program. Frankly that you are studying this is a concern."

Combined Opinions Regarding Fitness Testing

Participants answered six opinion questions concerning fitness in general and fitness as it pertains to physical education professionals (Table 1). Participants were supportive of physical education professionals being fit. They were also, but to a lesser degree, supportive of the suggestions that PETE students should be required to pass a fitness test and that practicing physical educators should be required to pass a fitness test on a regular basis.

Analysis of variance results indicated statistically significant differences on whether PETE students should be required to pass a fitness test, $F(1, 160) = 14.52$, $p < .01$. Programs that had fitness testing were more supportive. Furthermore, fitness testing of physical education teachers received significantly more support from fitness testing program participants than their nonfitness testing counterparts, $F(1, 160) = 4.78$, $p < .05$. Participants' opinions on the other four statements regarding PETE programs were not statistically different based on whether the program had fitness testing, and opinions on all six statements did not significantly differ by whether the program was NCATE accredited ($p > .05$).

Discussion

The purposes of this study were to investigate the differing measures used to assess fitness levels of PETE students at 4-year colleges in the United States and to ascertain an overall opinion of fitness testing within the physical education profession. Furthermore, the researchers sought to determine the degree to which fitness testing is not conducted and the rationale for not doing so.

Table 1

Participants' Opinions of Fitness Testing According to Fitness Testing Policy

Opinion statement	Strongly agree		Agree		Neither agree nor disagree		Disagree		Strongly disagree		*M*		*SD*	
	Do %	Do not %	Do %	Do not %	Do %	Do not %	Do %	Do not %	Do %	Do not %	Do	Do not	Do	Do not
Physical fitness is an important attribute of a physical educator.	79.8	81.0	19.2	15.9	1	3.2	0	0	0	0	4.79	4.78	.44	.49
PETE students should be required to pass a fitness test or tests to graduate.	40.4	22.2	30.3	19	12.1	22.2	12.1	19	5.1	17.5	3.89	3.10	1.21	1.41
Elementary and middle school physical educators should be physically fit.	76.8	73	21.2	23.8	2	3.2	0	0	0	0	4.75	4.70	.48	.53
Secondary high school educators should be physically fit.	77.6	73	21.4	23.8	1	3.2	0	0	0	0	4.77	4.70	.45	.53
University physical education instructors should be physically fit.	71.7	69.8	25.3	23.8	3	6.3	0	0	0	0	4.69	4.67	.53	.61
Physical education teachers working in schools should be required to pass a fitness test (e.g., Fitnessgram) on a regular basis just like other professionals such as military personnel and firefighters.	23.2	14.3	29.3	20.6	21.2	19	17.2	19	9.1	17.5	3.40	2.95	1.27	1.30

Reasons for Fitness Testing

Evidence that the "physically literate individual [can]… achieve and maintain a health-enhancing level of physical activity and fitness" is a component of NASPE's (2014) Standard 3 and is a requirement for collegiate administrators who seek NCATE accreditation for their program. Providing evidence to meet this standard, as evidenced by qualitative responses, appears to have led many program administrators to adopt new or alter former fitness tests. Two thirds of participants (62%) said their faculty began testing students within the past 5 years, with accreditation cited as the primary reason (42.86%).

Only 35% of participants reported that other majors were required to pass fitness tests. This is important, as limiting fitness testing to PETE programs may reduce the number of applicants to the program (Baghurst & Bryant, 2012). Students fearful of testing may choose a nonfitness testing major, and responses indicate that several kinesiology-based alternatives are available. Garrett and Wrench (2008) reported that students either strongly like or dislike fitness testing, and students may simply elect a similar major to avoid testing.

Testing appears to be driven by how and when it fits within a specific course. Testing does not appear to occur during classes in which one faculty member is responsible for all testing. As multiple faculty administer the test for almost half (45.5%) of the programs, there may be issues with reliability and validity. Some participants (7%) have students administer the test, generally reported as seniors assessing sophomores, to provide them with experience prior to conducting assessments as first-year teachers. Unfortunately, even with faculty supervision, intra-examiner reliability is a concern.

It is not surprising that Fitnessgram was the most commonly used assessment (66%) of the participants whose programs had a standardized test requirement (82%). Because many state and school district officials have adopted Fitnessgram (Fitnessgram, 2013), it is logical to provide students with an experience that they may use when they become educators. Unfortunately, there is little consensus on the passing requirements of Fitnessgram. In addition, other tests were varied, and some participants said their programs do not have a required passing mark, but have specified participation as the focus.

For students who could fail the fitness test, it was encouraging to see that many programs offered remediation to the student prior to a retest. Yet, these programs accounted for less than half of respondents (39%), and over a quarter of participants (26%) said they do not provide assistance. Program faculty should be encouraged to adopt remediation strategies to assist students, as social support and encouragement may motivate students to achieve goals (Cox, 2011).

Reasons for Not Fitness Testing

Two thirds of the respondents in the present study that opted not to fitness test had NCATE-accredited programs. Thus, concerns with the legality of fitness testing in addition to a perceived lack of benefit appear to impact the use of testing. Staffo and Stier (2000) reported that liability coverage is generally lacking for programs and administrators, which may influence whether fitness testing occurs. Thus, researchers should investigate how programs that are NCATE accredited meet Standard 2 without fitness testing.

Some participants also cited time and effort issues as determinants for not testing. This responsibility may be part of a new faculty's roles and responsibilities and could lead to increased faculty turnover (Ryan et al., 2012). Researchers should consider differentiating between programs that are research oriented versus those that emphasize teaching to determine whether a specific emphasis at the university level impacts testing procedures.

Opinions About Fitness and Fitness Testing

It is encouraging that the majority of PETE decision makers value fitness among physical educators at all levels and believe that they should be fit (Table 1). In a recent discussion forum ("In Light of the Editorial," 2007), one individual stressed the need for modeling physical fitness throughout a career; thus, that university educators should be perceived as fit in the present study is noteworthy. Baghurst and Bryant (2012) suggested that physical educators at all levels practice unhealthy behaviors—and would not be perceived as fit by their students—even though perceptions of fitness may impact learning (Dean et al., 2005; Thomson, 1996) and a fit physique is interpreted as a healthy physique (Garrett & Wrench, 2008). In a position statement, NASPE (2009) stated that participation in physical activity leading to health-related fitness was an important behavior for physical educators at all levels. Perhaps the most effective means to encourage fitness among current and future physical education professionals is to tell them it impacts job prospects (Staffo & Stier, 2000), as job descriptions are beginning to include evidence of a healthy lifestyle as a requirement (Baghurst & Bryant, 2012).

Participants whose programs do not have fitness testing were significantly less supportive of fitness testing PETE students. Intuitively, this is not surprising given that participants were program decision makers at their respective institution. Thus, although most participants strongly supported fitness values, testing was more controversial. This is reflected in the significant differences observed on opinions associated with fitness testing physical educators in the field, where participants whose programs do have fitness testing were significantly more supportive of the suggestion. Some have called for physical and health educators at all levels to demonstrate fitness (e.g., NASPE, 2009; Pate et al., 1995). Thus, ascertaining how enthusiastic PETE decision makers would be about testing themselves would be interesting. Vice versa, physical education teachers may have different opinions about fitness testing both themselves and collegiate physical education faculty.

Role of Fitness Testing

Fitness testing is not without controversy (Baghurst & Bryant, 2012; "In Light of the Editorial," 2007; "Should Physical Education, Dance, and Recreation Educators," 1992; "Should Physical Education Majors," 2001), and the discrepancy that participants valued fitness but not as much as fitness tests suggests that participants view fitness testing in its current form to be ineffective. Perhaps part of the problem lies with the ambiguity of NASPE's (2014) Standard 3, whereby the "physically literate individual [can]… achieve and maintain a health-enhancing level of physical activity and fitness." The definition of a health-enhancing level of physical activity and fitness is unclear. For example, some researchers have suggested that 10,000 steps, or 5 miles of movement per day, equates to healthy levels of fitness (Le Masurier, Sidman, & Corbin, 2003) and may have a positive impact on the health of unfit undergraduate students (Tully & Cupples, 2011). Le Masurier and Corbin (2006) found that youth who were considered fittest had completed the most number of steps per day, indicating that measuring steps, or even movements via accelerometer, may be an alternative measure of student fitness.

The ambiguity of Standard 3 appears to have led many program faculty to make their own interpretation, and we found differences among programs for almost every aspect of fitness testing. The result on a national level is a nonstandardized, almost haphazard measure of fitness whereby students with low or poor fitness levels (if even tested) may graduate from one program yet be required to retest many times or even be encouraged to leave the program in another. Thus, we would recommend, based on our data, that administrators of accreditation bodies

clearly stipulate the expected requirements for meeting and achieving standards associated with the demonstration of health and fitness among students.

Limitations and Future Research

This study has limitations that provide avenues for future research. Although the response rate was good, those who did not respond may have had different responses. Furthermore, because participants were not asked to identify their program, no delineation between program emphases was determined, and responses may have differed depending on whether an institution was teaching or research focused, for example. Persons responsible for the program served as participants and opinion responses may have been different among general PETE faculty who were largely responsible for fitness testing. Thus, future research may wish to consider the opinions of all faculty and students within a program. Some participants did not provide a clear response to why their program did not have fitness testing, which was frustrating. Future researchers should consider a qualitative design such as focus groups or interviews to provide a deeper, richer understanding.

Last, because of the recent efforts to increase physical activity in schools (e.g., Let's Move Active Schools, 2013), a study to determine whether physical educators' fitness is perceived to be a more important attribute than their ability to demonstrate fundamental skills would be interesting. For example, perhaps a standardized skills test may be more meaningful than a fitness test in determining the effectiveness of future physical educators.

Conclusions

We have demonstrated in this study the diverse manner in which fitness testing is conducted in PETE programs with an explanation of when, of why, and by whom testing occurs. Many participants chose not to use fitness tests even though they were expected to adhere to NCATE accreditation standards. Thus, future researchers should consider whether fitness testing in its current form is achieving the goal of achieving and maintaining healthy levels of physical fitness (NASPE, 2014). It is apparent that fitness is perceived as valuable to physical educators, but fitness testing in its current form may not be the most effective means of fostering a health-enhancing level of fitness in PETE students. Administrators of accrediting bodies need to consider whether more specific guidelines or different measures would better standardize evidence for meeting accreditation requirements.

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Exploring Secondary Physical Education Teachers' Reading

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Abstract

Teacher quality is important in teaching for effective learning. Teaching for effective learning involves a complex repertoire of pedagogical content knowledge and professional learning engaging current learning theories to keep abreast of and critique theories of learning and teaching and their implications for practice. In this paper, I reported on an exploratory investigation dealing with secondary physical education (PE) teachers' use and familiarity with academic literature. Fifty-three Australian PE teachers provided data for this pilot investigation via an online survey. The results indicate that the secondary PE teachers had limited knowledge of research, limited interest in reading academic writing, and sometimes mistrust of the motives behind research. Generally, PE teachers did not see academic writing as responsive to the needs of physical education practitioners in the field. Given the sample size, it is difficult to generalize the results and make conclusions about secondary PE teachers' relationship with academic literature. However, small-scale preliminary studies are like a jigsaw puzzle: Piece by piece researchers reveal incrementally by description, explanation, and proposition the profession of teaching, leading the field toward better practice. Further research is required with a larger sample size, with other methodologies (e.g., participant interviews), and in other countries to test the themes that emerged from this research and to extend the limited data-driven research in this area of PE teachers' continued professional learning.

Keywords: *physical education; teaching; academic and scholarly writing; reading*

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Introduction

Teacher quality is important as teachers are the greatest source of variance in the student learning equation (Hattie, 2003), providing the normative classroom environment and the contextual conditions for learning (Darling-Hammond, 2000). Teacher quality is connected to teaching for effective learning (Department of Education and Children's Services, 2010; Edwards, 2000; Rowe, 2003). Teaching for effective learning involves a complex repertoire of pedagogical content knowledge and professional learning engaging current learning theories to keep abreast of and critique theories of learning and teaching and their implications for practice (Department of Education and Children's Services, 2010). Teachers may gain this new knowledge and tested knowledge from scholarly reading.

Quality teaching is then about teaching for effective learning, and this includes curriculum and pedagogical improvement, the circulation of tested knowledge, and new ideas. Thus, physical education (PE) teachers' beliefs and understanding about student learning in PE should be evidence based and therefore grounded in contemporary theory (Bransford, Brown, & Cocking, 2000).

Bransford et al. (2000) asserted that teacher reflection on research and theory may have a positive impact on improving an enacted curriculum as it potentially leads to a "rethinking of what is taught, how it is taught, and how learning is assessed" (p. 13). Teachers' knowledge of subject matter is a relevant part of their professional knowledge base (Beijaard, Verloop, & Vermunt, 2000), and researchers of teacher professionalization have indicated that development of this professional knowledge is a lifelong process (Amade-Escot & Amans-Passaga, 2006).

Therefore, PE teachers' professional pedagogical content knowledge should be under continuous reflection and informed by tested information and grounded in learning theories (Amade-Escot & Amans-Passaga, 2006). By integrating theories of curriculum, effective teaching, and assessment with the design and enactment of teaching, PE teachers can use their theoretical understandings as the basis for making ongoing, principled decisions about practice (Timperley, 2008). I suggest that this would require PE teachers to be cognizant of academic discourses and scholarly writing concerning teaching and learning and to use relevant tested information from PE research in their teaching. This exploratory investigation therefore is about the relationship secondary PE teachers have with academic writing, particularly research publication, but also scholarly writing appearing in professional publications, and the teaching of PE teachers in Australian secondary schools. I use the term *research* to indicate evidence-based investigations, that is, tested information that may be used to confirm or refute a theory or that may be used as a basis for taking action or developing understanding that improves teaching and learning (Learmonth, 2003).

This research into secondary PE teachers' use of academic writing and research to inform teaching is potentially significant because Australian PE teachers' interactivity with research and scholarly writing—the extent to which teachers take these discourses and related research findings into their classrooms—has not previously been investigated. This research will be of further interest because researchers will be able to compare academic concepts about enhanced teaching and learning in PE and teachers' concepts of the usefulness and impact of research and academic discourse. Despite nearly 2 decades of PE researchers suggesting the need for a paradigmatic shift away from a traditional PE method (Metzler, 2011) to a curriculum informed by tested curriculum models that enhance games and sport teaching (Kirk, 2010; Metzler, 2011), contemporary PE pedagogical models have yet to make a significant impact on Australian PE

teachers' games and sport teaching (Pearson & Webb, 2011; Pill, 2009). This begs the question, to what degree is PE teaching informed by academic reading? This is not to suggest that good research and scholarship has no impact on practice. For example, it should be reasonable to assume that PE teachers go through teacher education programs that are grounded in research-informed understandings of best practice.

However, the relationship among knowledge generation, dissemination, and action historically has been the cause of researcher disillusionment because it could appear that teachers ignored research efforts (Learmonth, 2003). Revealing what professional literature PE teachers consider and how, why, and what research impacts their practice could lead to better research impact and effect on school PE by understanding how and where the transfer of knowledge occurs.

Researchers have suggested that research has the potential to be a source of new ideas about teaching and learning for enhanced student outcomes (Malouf & Schiller, 1995; Putnam & Borko, 1999). The idea of encouraging teachers to use best practice based on research evidence has gained extensive support (Nuthall, 2004; Vaidya, 2001). Although the tested information from evidenced-based investigations should provide "new and useful ways of thinking about teaching [that] may eventually enter into teachers' practical reasoning and affect their practices" (Richardson, 1994, p. 6), the broad issue is if, and to what extent, this happens in secondary school PE.

Continuous Professional Learning (CPL)

Armour and Yelling (2004) suggested that in England PE teachers continuous professional learning (CPL) experiences frequently lack coherence and relevance. In Australia, CPL is a focus of education policy through the National Professional Standards for Teachers (Australian Institute for Teaching and School Leadership [AITSL], 2011). For instance, Standard 6.2, engage in professional learning and improve practice, which provides direction to "plan for professional learning by accessing and critiquing relevant research" (AITSL, 2011), is an example of achieving this teaching standard at the Highly Accomplished Teacher level. There is also an increasing interest in teachers' professional development as a means of raising teaching standards and student educational attainment with requirements for teachers to undertake mandatory hours of professional learning to maintain accreditation to teach (Teachers Registration Board South Australia, 2014).

Teachers' Professional Reading

In reviewing the literature in the area of teachers' professional reading, I found a long-standing disjunction among research, academic discourse, and the work of teachers (Bransford et al., 2000; Figgis, Zubrick, Butorac, & Alderson, 2000; Nuthall, 2004). Cogan and Anderson (1977) suggested that "most educators, including classroom teachers, generally agree that the classroom teacher does not read enough" (p. 254), and this situation may persist. Researchers have also suggested that teachers do not engage easily with educational research (Durrant, 2004; Hargreaves, 1996). Although innovative, new, and potentially useful ways of thinking about teaching revealed in academic discourse and research findings may eventually enter into teachers' practical reasoning and affect their practices (Richardson, 1994), some researchers have suggested that teachers often do not consider educational research as useful or influential (Biddle & Saha, 2002; Burkhardt & Schoenfeld, 2003). Sellars and Stevens (1983) suggested

a historic lack of communication, or interchange of knowledge, between research and teacher decision making. Latham's (1993) indicated in his research on the reading habits of lawyers, engineers, and teachers that teachers are the least likely to read their professional literature, and Smith (1996) concluded that educational research, although not lacking, influences few debates, changes in practice, or policy developments. Waghorn and Stevens (1996) went further, suggesting that the gap between pre-service teachers' theoretical beliefs and their practical experience in the classroom confirmed a theory–practice gap.

Teachers have criticized educational research as trendy theory, theoretical and idealistic, and unrelated to practice (Dunseath, 2000; Nuthall, 2004). Historically, the relationship between educational research and educational practices has been considered at best tenuous (Smith, 1996), with part of the reason for that being teachers professional reading habits. More recently, Henig (2008) asserted that most educational research goes as unnoticed as the proverbial tree falling in the forest. It is apparent that some researchers think that educational research will not make a substantial difference to educational practices in school settings. Teachers may see educational research as serving other interests and ends rather than prompting reflexivity and promoting change. For example, Cannon (2006) suggested that many teachers assume researchers study, discuss, and write about what interests them rather than what teachers need. Eisner (1994) also pointed to an underlying assumption of many teachers that educational research was conducted primarily to serve the careers of the educational researcher.

The interrelatedness among research, theory, and teaching practice is therefore brokered by the lens through which teachers view academic discourse and the reason it is pursued (Dinham, 2007; Huberman, 1990; Gore & Gitlin, 2004; McMeniman, Cumming, Wilson, Stevenson, & Sim, 2000), with a belief that research is often too remote from classroom practice (Ferrero, 2005). Gore and Gitlin (2004) were particularly taken by the "consistent and emphatic" (p. 37) way teachers acknowledge that they do not highly value "the practicality, contextuality, credibility and accessibility" of academic research (p. 39).

Researchers have mentioned the language of academic discourse as a factor influencing teachers' choice to engage with academic literature (Bransford et al., 2000; Ebbutt, Worrall, & Robson, 2000; Joram, 2007). Although they are capable of reading the theory, many teachers choose not to engage as the language is not consistent with the discourse of their daily professional practice. Additionally, a supposed disparity between what researchers perceive as problems and what teachers face as problems on a daily basis may lead to a belief by teachers that research and academic writing is isolated from current classroom concerns and subsequently has little to offer them (Andrews & Harlen, 2006; Hutchens, 1998; Joram, 2007; Robinson, 1998; Vaughn, Klinger, & Hughes, 2000).

In contrast to the minimal impact research and scholarly literature has on teacher practice, researchers have also noted the important potential role of academic literature and research in influencing teaching practice. Educational studies may function to facilitate teaching competence (Holligan, 2006). For example, Holbrook et al. (2000) asserted that knowledge gained from research was essential for teachers' better understanding of their work and therefore improvement of schooling. Also, Galton (2000) found teachers in the United Kingdom were prepared to engage with research as long as it had a direct connection with specific classroom practices.

Phelan, Anderson, and Bourke (2000) analyzed educational research in Australia and claimed that suggestions that educational research was essentially irrelevant to educational practice were inaccurate. They argued that Australian educational research is applied and has offered much to teachers and other stakeholders in education. Teachers may become interested

in research literature when ambition in senior leadership positions is aroused within the teacher (Holbrook et al., 2000). Research impact also appears to rise with increased postgraduate qualifications, especially among secondary school teachers (Everton, Galton, & Pell, 2000).

Given the uncertain picture of the relevance of educational research to teachers generally obtained from this review, the purpose of this pilot investigation was to explore secondary PE teachers' interactions with academic writing, educational research in particular. Since I did not uncover research specific to secondary PE teachers in the literature review for this investigation, the impact conundrum presented in the preceding consideration of teachers' professional reading remains a fertile field for inquiry.

Methods

In this exploratory investigation, I used an online survey tool to gather data. A second phase to the investigation is planned, namely, to discuss the results emerging from the initial investigation in more detail through interviews with secondary PE teachers. In this paper, however, I reported on the first phase of the investigation, the preliminary survey. Kervin, Vialle, Herrington, and Okely (2006) suggested the value of small-scale preliminary studies such as the one presented in this paper. Piece by piece, as if putting together a jigsaw puzzle, researchers incrementally reveal by description, explanation, and proposition the profession of teaching, leading the field toward better practice.

Internet surveys are an increasingly common data collection technique because of their ease of use for potential respondents and the relative anonymity they provide (Ary, Cheser Jacobs, Razavieh, & Sorensen, 2010). The survey was open for 10 months, July 2010 to May 2011. The survey attracted 53 respondents (30 males, 23 females), with 45% of respondents (n = 24) in their first ten years of teaching, 30% (n = 16) teaching between 11 and 20 years, 13% (n = 7) teaching between 21 and 30 years, 10% (n = 5) teaching 31 to 30 years, and 2% (n = 1) teaching more than 40 years.

A qualitative framework was adopted as the aim was to understand the complexity of the data rather than to uncover a knowable truth (Kervin et al., 2006). This framework led to a process involving the aggregation of the collected words into categories of information that presented the diversity of ideas gathered during data collection (Creswell & Plano Clark, 2011). The research commenced once university ethics approval had been given.

Researchers generally cannot survey an entire target population, so they gather data from a sample of the population (Ary et al., 2010). Sampling from the population of secondary PE teachers occurred by invitation via advertisements placed in a professional association e-news media to its members. The survey design contained both closed- and open-ended questions. Closed and open data sets were embedded so one data set provided a supportive role for the other data set (Creswell & Plano Clark, 2011).

Inductive data analysis proceeded from the data to interpretation via reasoning that general conclusions were established on the basis of the data gathered (Ary et al., 2010) once the data collection period ended. Creswell's (2002) data analysis spiral informed this process (Figure 1).

During familiarization with the data, a constant comparative process was employed whereby open coding was used to develop initial categories to reduce the data into manageable categories. After this inductive coding, patterns across categories were explored to identify initial themes (Ary et al., 2010; Strauss & Corbin, 1998). The data were reviewed in this manner several times to identify and then refine major themes, hence the notion of a spiral process. In the following section, the themes that emerged from this data analysis are reported and discussed.

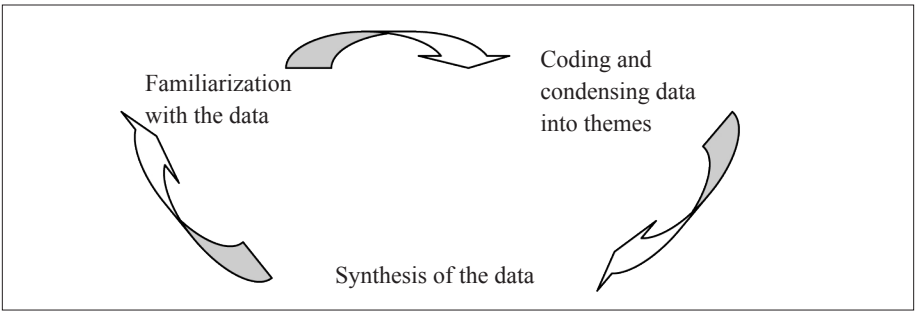

Figure 1. Creswell's (2002) data analysis spiral.

Limitations

The findings should be read with caution. The small sample size makes generalizations beyond the pilot project difficult. Every effort has been made to eliminate my bias on the research topic by grounding the discussion in the data or by acknowledging my thoughts where they occur in the paper.

Results and Discussion

Of the 53 respondents, 45% (n = 24) indicated researching PE and publishing that research is important, with 32% (n = 17) indicating research was very important and 13% (n = 7) indicating research was only somewhat important. Survey comments associated with the importance of research included that research was necessary as "teaching is changing at a rapid rate and to best harness best practice sport teaching needs to be researched and published so that best practice can always improve." Participants also recognized the relevance of remaining abreast of current content knowledge, for example, "need to be current in your knowledge, research informs practice, therefore having relevant research material to draw on as evidence of topics is highly valuable." The value of research "to initiate new thinking" was a general positive theme among the data about academic reading.

Thirty-eight percent (n = 20) of the respondents indicated a connection between planning and teaching of sport and PE research literature, with 11% (n = 6) indicating a strong connection. However, as will be discussed in more detail below, many respondents indicated that research and scholarly writing did not inform their PE teaching. This is despite 45% (n = 24) of respondents recognizing research and publication of findings as important. The PE teachers explained teaching as governed by a complex set of situated factors not easily captured by research methods. The PE teachers' beliefs about teaching were more determined by influences outside the classroom (e.g., conversations with colleagues) and from teaching than by scholarly or academic reading.

The personalized nature of PE teachers' theories underpinning practice has been previously commented upon by Green (2000, 2002). Green (2002) noted that the curriculum practice of PE teachers was influenced substantially by the "everyday philosophy" of the teacher, a philosophy "made up of more or less mythical ideas regarding the supposed worth of their subject… [philosophies that] appear somewhat confused, at times contradictory, rather impressionistic and only partly formed" (p. 65).

Theme 1: Knowledge of Research

A consistent connection between secondary PE curriculum planning and enactment and research and scholarly writing was not evident in this study. Only 28% (n = 15) of respondents indicated that their PE curriculum and planning was based on research evidence of pedagogical practice. An even smaller number, 11% (n = 6), indicated a strong connection between research and their practice. One teacher noted that the school they currently taught at "is the first school I have worked at whereby the supporting evidence is expected to accompany your teaching practice." Supporting findings about the beliefs of PE teachers naive beliefs driving pedagogical practice by Green (2000), one respondent noted that "unless the teacher actively chooses to stay abreast of current pedagogical research, this knowledge is not renewed or reinforced."

The data indicated that research quoted in student assessment tasks appeared to be one way academic writing entered school PE and became available to the PE teachers. For example, typical of the responses received that made this connection was, "Assessments, especially in senior phys-ed, are based on using research articles." However, the following comment summarizes secondary physical education teachers' generally limited knowledge of research:

> I suspect a lot of sport teaching practice is NOT influenced by physical education research. What I witness at various school based sporting situations, suggests to me that many teachers/coaches in schools are not up to date with the ideas.

This comment also indicated the centrality of sport-related games in secondary PE. Researchers have previously suggested sport is a substantial component of secondary PE and consequently a significant experience for PE students in Australian schools. Sport is culturally valued as a community practice, a context for movement skill learning, and a vocational pathway (Drummond & Pill, 2011; Laker, 2002; Penney, Clarke, & Kinchin, 2002; Wuest & Bucher, 2006). To that end, the data related to respondents' knowledge of research areas in PE revealed that some respondents (n = 8) recognized the teaching games for understanding (TGfU)–game sense approach (den Duyn, 1996, 1997) as a research and scholarly writing agenda.

Theme 2: Communicating Research Knowledge to Physical Education Teachers

The information in Table 1 may indicate that many respondents had a limited desire to access professional and academic reading to inform secondary PE teaching, as 62% (n = 33) did not respond to the question about the publications read for professional learning. Additionally, the number of respondents accessing research publications was low (n = 9, 17%). Indeed, the comment "Big worded documents at the bottom of the list" reflects the general sense of where research publications sit in the order of relevance for the secondary physical education teachers in this research. The role of conferences in providing an avenue for research information dissemination and communication to teachers was evident in the descriptive data, particularly "research that is passed on in a practical sense through sessions at conferences." PE academics presenting at conferences, such as the state-based health and PE conferences run by professional organizations such as the Australian Council for Health and Physical Education, was indicated as a way of communicating, or interchanging, knowledge of educational research for teachers. This indicates that although physical education teachers may not engage with research and scholarly publications, they are not isolated from academic discourses and research-informed ideas about best practice PE teaching if they are attending CPL events where PE academics are making themselves available.

Respondents also commented on the role of the head teacher or head of department as the person responsible for disseminating literature to physical education teachers. Mostly,

however, the pedagogical content knowledge that the respondents reported as influencing their PE teaching was that which was encountered during pre-service teacher education and that which they learned "on the job." Learning on the job is similar to the findings by Green (2000, 2002) about the "everyday philosophy" influencing physical education teachers' understanding of pedagogical and curriculum practice. The teachers' beliefs influenced their perceptions and judgments about teaching and learning, and they often formed their beliefs from practical and personal experiential knowledge. Pajares (1992) also observed that teachers' beliefs about teaching are formed from practical and personal experiential knowledge. However, if practical wisdom based on academic reading engaging personal experience is critical to the framing of quality teaching and teaching for effective learning (Buchmann, 1984; Feldman, 1997), it must be of concern if research dissemination does not engage the physical education teacher.

Table 1
Response to the Question, Do You Use Any of the Following to Stay Up to Date With Current Discourses, Thinking, and Research Evidence About Curriculum and Best Pedagogical Practice?

Publication type	*n*	Percentage of respondents
Research publications	9	17
Professional publications	11	21
Twitter feeds	5	9
Books	7	13
Professional association	18	33
No response	33	62

Theme 3: New Avenues for Research Dissemination

Five respondents nominated Twitter feeds as a dissemination format they use for professional learning. Reading teacher Twitter tweets and blog posts for professional learning is an interesting emergence that may be associated with teachers' appreciation of the learning that comes from the everyday reality of classroom practice (McMeniman et al., 2000). Increasingly, teachers are using social media such as Twitter, LinkedIn, and blogging platforms to write about and record their teaching. Moreover, teachers may perceive research as too removed from the everyday classroom experience and therefore divorced from the real work of teaching (Joram, 2007). Using social media platforms, taking what may be perceived as the overly technical writing (Joram, 2007) of research and moderating it to capture the essential learning for improved practice, could emerge as a way to put academic writing research in front of PE teachers. Few portals exist through which new knowledge about teaching and learning can enter schools (Elmore, 2002), a perception echoed in the survey comment "Very little research literature makes its way into schools first hand." The role of social media in getting PE research in front of teachers is an emerging area for investigation.

Theme 4: Finding Time to Read

Although teachers historically have not looked to research to inform their practice (Latham, 1993) and generally have not prioritized academic writing about best practice (Nuthall, 2004), I found in my investigation a latent desire by some respondents to access academic reading,

which was constrained by time pressures associated with the nature of teachers' work. For example, the survey comments that the "time that I have to focus on latest research is limited" and "time to find the research and include it in practice is difficult" are typical of the descriptive data alluding to time as an issue in locating, reading, and considering the implications from research and scholarly writing.

Mentoring PE student teachers on placement is a possible avenue for PE teachers to access research-informed ideas about curriculum and pedagogical practice despite PE teachers being "time poor." Earlier in the paper I suggested that it was reasonable to assume that all PE teachers go through teacher education programs that are grounded in research-informed understandings of best practice, positioning the pre-service PE teachers as a potential resource through which to mediate the search for academic reading. However, the following comment indicated that pre-service PE teacher education programs may not be the avenue for research to move from the "academy to the field" that may have been assumed. One teacher said,

> I ask on what their [student teachers'] pedagogy is based, and often the texts and research used in their pre-service training is the same as the 'knowledge' I received 25 years ago in university. I do not know why this is happening—it certainly does not instill a commitment in new PE teachers to be innovators or lifelong learners.

This comment may be an isolated experience and should be seen as a potential concern requiring further investigation and not a comment generally about PE teacher education programs in Australia. It also stands in contrast to other researchers' comments indicating that pre-service teachers are limited and constrained in their opportunity to enact how they teach and how they would like to teach while undertaking professional teaching experiences (Graber, 1995; Pill, Penney, & Swabey, 2012; Waghorn & Stevens, 1996). This containment also stops the flow of possible ideas from pre-service education into the in-service field of practice.

Theme 5: Physical Education Teachers Are Interested in Practical Applications

I noted in the literature review that teachers may perceive academic writing and research in particular as having little transfer or practical application, either "esoteric or irrelevant to teachers concerns" (Galton, 2000, p.5). The data in this investigation showed evidence of this. For example, one participant said, "Academic text is generally aimed at impressing academic peers and hasn't been tested in the real world." The misunderstanding of academic writing appears to stem from the teachers' perceptions of the absence of research connection to the natural dynamics of the teaching setting. This is noted in the following comment typical of survey responses touching on this theme: "Few of those [writers] are actually involved first hand in delivery in schools. Many are in tertiary institutes and delivering examples to undergrads, but it is hard for these practices to be widely accepted at times." In these two quotes, the participants call into question the credibility of research. They do not see researchers as credible as they do not have classroom experience or have been absent from the classroom for some time.

The participants generally felt that the connection between what is said in academic writing to be effective PE games teaching and the site-specific context of PE teaching was limited. The descriptive data indicated that teachers perceived knowledge for teaching from research is generated from outside the classroom (Cochran-Smith & Lytle, 1999). For example, "few of those writing are actually involved firsthand in delivery in schools." Furthermore, the descriptive data collected in this investigation indicated that most of the respondents were unlikely to read publications if the language did not connect to the daily linguistic conventions of their work (Ebbutt et al., 2000).

Finally, the person-to-person nature of CPL emerged as the most highly valued form of professional learning. Nuthall (2004) suggested teachers are convinced they develop their teaching skills mostly through experience in the classroom and alongside practices they see other teachers using. Armour and Yelling (2007a) suggested that PE teachers in England place high value on informal collegial professional learning. The favoring of person-to-person cooperative collegial professional learning by respondents in this research reinforces the value of academics presenting their work in the practical context of conferences for PE teachers or in other CPL contexts. Although in reality CPL occurs in many ways, it is not uncommon for PE teachers to identify professional learning as going to courses (Armour & Yelling, 2007b).

Conclusion

Although the assumption of direct transferability and practical applicability of empirical research to the context of teachers has been problematized (Gore & Gitlin, 2004), Galton (2000) suggested that the challenge facing teaching professional learning is to enhance teachers' capacity to develop teaching that is informed by evidence by finding ways to provide teachers with extended contact with research. The respondents suggest in their comments that challenge continues to exist in the field of secondary PE teaching in Australia.

In this research, although some of the PE teachers valued academic and scholarly writing, generally, the participants did not see PE academic writing as responsive to the needs of the practioner in the field. The reasons presented by respondents for the lack of impact of academic literature upon PE teaching centered on

- questions about the intentions behind the pursuit of research publication,
- application of the research to the contextual work of the PE teacher, and
- time pressures associated with the nature of PE teachers' work in schools that moderate intentions of pursuing academic reading to inform practice.

This investigation was exploratory in nature to gain a "picture of the landscape" as it relates to secondary PE teachers' use of academic and scholarly writing to inform teaching and learning. Further investigation of a larger sample and of the nuances of diverse settings is required. This would include testing the claims made in this paper and extending the understanding of the impact and possibilities for academic and scholarly writing impacting PE teaching in schools. Currently, little is known about Australian PE teachers' engagement with academic and scholarly writing and the impact it has on PE teaching and PE teachers' CPL. The role of academic and scholarly writing in informing, provoking, and challenging Australian PE teaching and PE teachers' understanding of their practice and the role it can play in PE teachers' CPL has yet to be explored.

Potentially, academic and scholarly writing is important in providing PE teachers with the knowledge, skills, and understanding to enhance student learning. As I noted earlier, the question for further consideration is how and where the transfer of this knowledge occurs. Gore and Gitlin (2004) suggested that teachers have historically not been rewarded for keeping abreast of research and academic writing. It may be reasonable to expect that "good" teachers will continue to reflect and improve their practice, which may include accessing current research and scholarly writing, but this is not a job requirement. This context may be about to change with the advent of the *National Professional Standards for Teachers* (AITSL, 2011). Future researchers should consider the influence the AITSL's *National Professional Standards for Teachers* has on

PE teachers' engagement with academic and scholarly writing, particularly providing teachers with extended contact with research.

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BEST PRACTICES ~ FROM THE FRONT LINES

Kinderkinetics: Best Practice in South Africa

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In 1996, physical education (PE) was removed from the school curriculum in South Africa. The cessation of this much-needed service delivery to children from professionals with specialized knowledge in the field of movement and physical activity led to the development of a new professional field called kinderkinetics in South Africa, which emerged from human movement science (Pienaar, 2009). Although PE was reintroduced in the South African school curriculum in 2012, after an absence of more than 10 years, the delivery of PE programs in South African schools is currently lacking and also in an unacceptable state of affairs, complicating the situation (De Ridder & Coetzee, 2013).

Physical activity and participation in structured movement development programs are, however, critical to developing fundamental movement patterns, perceptual motor skills, and self-confidence in children (Pienaar, 2009) and to rectifying problems in this regard.They are also a critical aspect of children's school readiness makeup as they are related to a positive cognitive outcome and associated with health consequences (Coe, Pivarnik, Womeck, Reeves, & Malina, 2006).

Kinderkinetics as a Science

The word *kinder* refers to the specialization area that is focused on 0- to 13-year-old children, and *kinesis* (movement) refers to optimizing and rectifying children's movement from birth. Kinderkinetics is mostly focused on the development of typically developing children. Children with developmental needs are assisted in the profession of kinderkinetics through scientifically based and individualized exercise programs in their psychomotor, physical, and neuromotor development. Physical activity is the key to realizing these goals within a kinderkinetics program, adapted according to the developmental needs of the child and the specific program that is offered.

Kinderkineticists also use physical activities as the key to developing success in children who deviate from the norm, but in an adapted form, based on individual needs. Movement offered

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in the form of adapted physical activity is consequently service delivery, coaching, learning, or empowerment by a qualified person to increase the physical activity goal achievement of children aged 0 to 13 years with movement limitations or social obstacles (Pienaar, 2009). Thus, to achieve the goals of physical activity programs, children must use cognitive, affective, and psychomotor abilties. The ability-based treatment method is prominent in practicing this profession, where the focus is on the person, not the problem, and holistic and person-centered thought is emphasized (Pienaar, 2013). Kinderkinetics is the professional field that, from a health perspective and based on educational principles, is focused on increasing the total well-being of children aged 0 to 13 years by stimulating, rectifying, and optimizing and promoting age-specific neuromotor and physical movement (Pienaar, 2009).

Best Practice

The following principles distinguish kinderkinetics from other programs that are focused on the motor development of children in South Africa.

Scientific-Based Training Curriculum

Kinderkinetics, as a pediatric exercise science, is studied intensively over a 4-year period, guided by motor learning principles (Auxter, Pyfer, Zittel, & Roth, 2010; Cheatum & Hammond, 2000; Gallahue & Ozmun, 2006; Malina & Bouchard, 2004; Sherrill, 2004), dynamic systems and biopsychosocial theories (Bronfenbrenner, 1979), and the physical activity guidelines for children as stipulated by the World Health Organization (2013). Kinderkineticists are trained to use these principles to promote functional growth and development, to use movement activities that promote/facilitate perceptual and appropriate motor development and sport-specific skill development, and are trained to implement appropriate rehabilitation strategies for children with growth and/or developmental disabilities and specific motor deficiencies. Aspects of kinderkinetics such as obesity and developing a healthy and balanced lifestyle in children are addressed in evidence-based kinderkinetics programs that are offered individually or in groups. This specialized program is delivered by highly trained health practitioners (Pienaar & Strydom, 2012). Kinderkineticists deliver services in a professional manner, in one-on-one or small group situations and in special classes that are usually set in the general or normal schooling environment.

Specialist vs. General Knowledge Based

To become a qualified kinderkineticists, students are trained at four South African universities/tertiary institutions following a 4-year degree integrated with laboratory and practical experience in various centers, and they are required to complete hands-on practical experience to obtain professional registration. The professionals who are trained to be kinderkineticists are thoroughly trained in childhood development and pediatric exercise science. They are also trained with the scientific knowledge that some children will have more motor delays and will struggle more with certain motor skills than others and that these delays will influence their development and total well-being. The training of a kinderkineticist is in three areas: (a) remedial, where the focus of the program is solely on children's needs (kinderkineticists are also trained to work with children with special needs such as learning problems, obesity, motor handicaps, disabilities, and posture deviations); (b) health improvement, where the focus is on improving the quality of life and health risks; and (c) optimization, where the focus is to improve the motor skills of the typical child without motor delays. Before students may apply

for professional registration as kinderkineticists, they must obtain 300 in-service practical hours. See Figure 1 for the scope of practice of a kinderkineticist. Kinderkineticists thus provide additional expertise to the field of physical education because of their specialized training in pediatric exercise science, for children from birth. Kinderkineticists are health practitioners who have applied their skills successfully not only in private practice but also as employees in school settings since 1995.

Professional Guidance

After kinderkineticist have finished their degree, they must register at SAPIK (South-African Professional Institute of Kinderkinetics). The vision of SAPIK is to be a scientific-based profession operating in a professional, excellent, and practical way to serve the community nationally and internationally with the following core mission:

- to sustain and develop the profession to a nationally and internationally recognized modality of pediatric exercise intervention and prevention through physical activity,
- to benchmark kinderkinetics against world-class standards,
- to provide outstanding education and training, and
- to contribute to society nationally and internationally.

Kinderkinetics has already gained substantial recognition as a potential health discipline, and more than 150 practitioners are already working in this field, ranging from self-employment in the private sector, to employment in primary and pre-primary schools. Parts of the SAPIK website are open to the public with information regarding registered kinderkineticists and kinderkinetics in general, and registered kinderkineticists may obtain further information regarding the profession on a restricted part of the website.

Evidence-Based Practice

Kinderkineticists are guided by applied research where the growth, neuromotor development, and physical activity of children, as well as interventions to improve developmental delays and shortcomings, have been extensively researched within this pediatric exercise science. In this regard, researchers have studied obesity among children of different age groups and from different perspectives for a better understanding of the problem (Pienaar & Strydom, 2012), including the prevalence of childhood obesity in different age groups (Du Toit & Pienaar, 2003); relationship of childhood obesity with motor (Du Toit & Pienaar, 2003), fitness (Truter, Pienaar, & Du Toit, 2010), psychological (Kemp & Pienaar, 2010; Pienaar & Eggar, 2007), physiological (Kemp & Pienaar, 2010), and academic (Du Toit, Pienaar, & Truter, 2011) abilities; and relationships of obesity with diagnosed motor delays such as developmental coordination disorder among children (Pienaar & Eggar, 2007). Furthermore, researchers have published studies on children with motor development delays, such as developmental coordination disorder and the effect of intervention programs on the developmental coordination disorder status of these children (Coetzee & Pienaar, 2010, 2011, 2013; Peens & Pienaar, 2007; Peens, Pienaar, & Nienaber, 2007; Pienaar & Ernst, 2007; Pienaar & Lennox, 2006), and the effect of age-appropriate perceptual motor development programs on the motor and cognitive abilities of preschool children (Pienaar, van Rensburg, & Smit, 2011). The protocols of these intervention programs have been successfully implemented as intervention programs and are used by kinderkineticists countrywide. The students are also introduced to a practical internship during their final year of studies, where they experience what will be expected from them in practice.

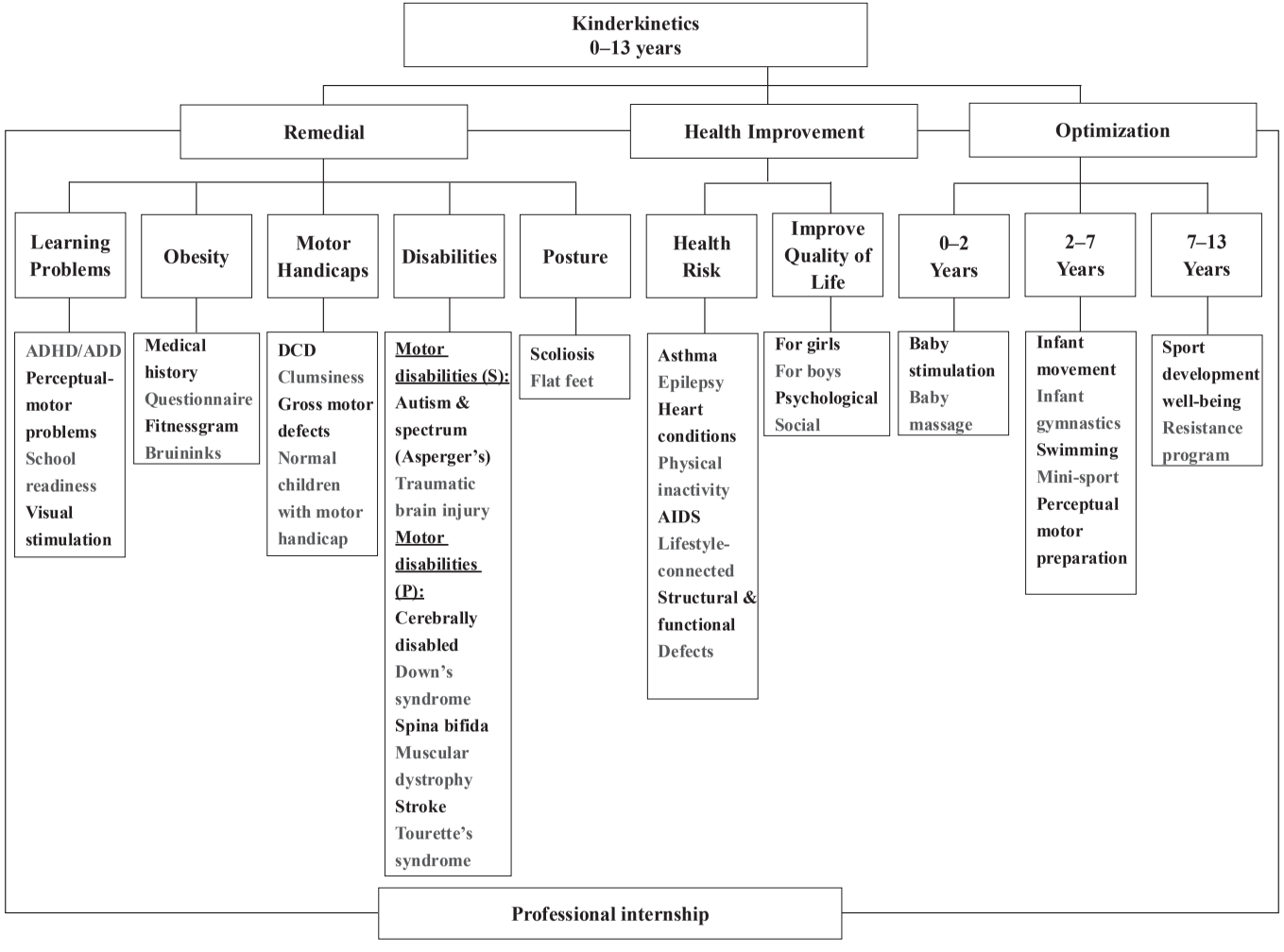

Figure 1. Kinderkinetics scope of practice. DCD = development coordination disorder. S = secondary. P = primary.

Practice-Based Evidence

Tertiary institution officials also work closely with kinderkinetics practitioners to provide them with relevant input regarding the challenges, as well as the opportunities, that kinderkineticists experience in practice, to make sure that the needs of children are addressed appropriately. Practitioners also play an important role on the professional board of this profession (SAPIK) offering guidance and relevant training in kinderkinetics.

Continued Professional Development

In pursuing excellence in this profession, SAPIK personnel support professionals on an ongoing basis to be better equipped personally and professionally by providing them with evidence-based programs that are relevant to the needs of the profession and society and by increasing opportunities for and participation in lifelong learning throughout their careers. To keep up with the latest research, graduate kinderkineticists are required to participate in professional development workshops and obtain a specific number of continued professional development points each year to improve their professional development.

Conclusion

This profession emerged due to the lack of physical activity in the schools after 1996. Kinderkineticists strive to apply the science of exercise in a way that children fully unlock their health promotional development and potential. This profession is not without challenges. One of the biggest challenges for kinderkineticists is understanding each generation of children and the demands that their lifestyles and socioeconomic status put on their development and well-being. Although the profession is still entrepreneurial in nature, the knowledge of trained kinderkineticists is sought after and they are employed in many working environments, and the current demand for their expertise outweighs the supply. To promote the value and increase the service delivery of this profession, more people must be made aware of the field of kinderkinetics in South Africa and internationally.

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COMMENTARY

Reflections of the 2014 Global Forum for Physical Education Pedagogy: Future Leaders' Perspectives

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Before you are a leader, success is all about growing yourself. When you become a leader, success is all about growing others. **—Jack Welch**

The final test of a leader is that he leaves behind him in other men the conviction and will to carry on. **—Walter Lippman**

Introduction

The Potchefstroom Campus of North-West University in South Africa was host to the 2014 Global Forum for Physical Education Pedagogy (GoFPEP 2014). The purpose of GoFPEP 2014 was to examine best practices in health and physical education. The overall goals of GoFPEP are to reexamine, rethink, and reshape physical education pedagogy and the preparation of physical education teachers (Edginton, Chin, Geadelmann, & Ahrabi-Fard, 2011). GoFPEP 2014 is the third forum to be held, with previous events having been staged in the United States and

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Germany on the topics of technology and the building of networks (Edginton, Chin, & Naul, 2012).

The GoFPEP Future Leaders Program provided an opportunity for select young and upcoming individuals to participate in the event. The purpose of the Future Leaders program is to provide young professionals with an opportunity to network and engage in international professional development activities. More specifically, the goals of the program are to cultivate individual strengths and talents among Future Leaders from health, physical education, and pedagogy disciplines; to develop research and innovation skills; and to create a global network of young, diverse, and innovative thinkers.

Zimbabwean/South African Perspective

by Sandra N. Dube

Reflecting on GoFPEP 2014, I can best decribe my experience as a Future Leader as incredible. To begin, it was a privilege to receive the world into South Africa. Being surrounded by the world's finest minds in the field of health and physical education pedagogy provided for an electric atmosphere, and like the proverbial sponge, the Future Leaders busied themselves absorbing as much as possible. The fact that everyone gathered in Africa for GoFPEP 2014 was phenomenal as it offered a rare opportunity to truly appreciate the strengths and weaknesses of physical education and health practices in Africa compared to the rest of the world. As illustrated during GoFPEP 2014, Africa, like the rest of the world, is not immune to the current health and physical education pedagogy problems facing teachers. South African youth from the North West province exhibit a sharp downward trend in physical activity during adolescence (Wushe, Moss, & Monyeki, 2014).

Exclusive to GoFPEP, the group discussions stimulated a robust, vibrant, and unending opportunity for exchange and sharing of ideas between people from all cultures, creeds, and corners of the world. Aside from the global links established, I benefited immensely as I was constantly challenged and stimulated. What remains etched in my mind is the sentiment echoed that, for all intents and purposes, physical education is fundamentally the same worldwide. The differences lie in the levels of importance attached to physical education programs from one place to another, the availability of facilities and equipment, physical education teacher training, and technological advances. Going forward, it is imperative that university faculty begin to offer support to physical education teachers in terms of continuous periodic training in new methodologies, pedagogies, and global best practice if child and adolescent physical activity participation in physical education classes is to improve.

Chinese/German Perspective

by Jiali Shen

I was honored to participate as a Future Leader in GoFPEP 2014 in South Africa. I had a great experience as a Future Leader and gained a great deal from the delegates. They opened my mind and brightened my career. Compared to GoFPEP 2012 in Germany, this Future Leader session was special and meaningful. I was excited when most delegates joined in the activities for Future Leaders. GoFPEP 2014 served as an outstanding platform for the Future Leaders, and I appreciated the GoFPEP 2014 organizing committee for providing young scholars with opportunities to learn and to practice.

As a Chinese scholar living in Germany, I experienced the cultural differences when participating in GoFPEP 2014. This really inspired me to think more about the importance of culture in relation to physical activity and health pedagogy. I, as well as the other Future Leaders, visited three local primary schools in Potchefstroom and found variations among the schools. I was led to the conclusion that finding a way to decrease that gap between the socioeconomic groups and implementing physical activities is important. The reality is that uniform standards cannot be provided across the board because of the different socioeconomic situations that exist; hence, any best practice model should be based on individual culture and conditions, and it should be possible to increase capacity and efficiency to promote learning for all students. Physical education and physical activity should not be limited to the school setting, but should be expanded outside of the school environment to the community and the family.

The forum united the Future Leaders with the mutual purpose of establishing best practice for today's children and the next generation of learners. My wish is to improve the quality of life, even if it is just a small step for one small group at a time. I am a physical education worker, and I endeavor to do the best I can.

German Perspective

by Marie-Christine Ghanbari

As a Future Leader, I had the chance to participate and network with experienced researchers from different countries at GoFPEP 2014. The 3-day experience was full of intercultural learning to address physical inactivity throughout the world. As a Future Leader, I think it is important to be connected with other researchers around the world to make intercultural learning possible ("Let's move around the world"). In the discussion groups, I had the chance to interact with these experts to improve physical activity participation and the living conditions for children and adolescents. As a Future Leader, I am a role model for the next generation. I had the opportunity to discuss my research and new innovative ideas with 86 experts from 46 countries. As Nelson Mandela (2002) offered, "History will judge us by the difference we make in the everyday lives of children." It was an outstanding scholarly experience, and I was honored to be part of GoFPEP 2014. I met experts in the area of physical activity and physical education, and these experts have become not only mentors, but friends.

Chinese/North American Perspective

by Xiafei (Emma) Nie

I can summarize participating in GoFPEP 2014 by drawing from an African proverb, "If you want to go fast, go alone; if you want to go far, go together." These words are simple yet powerful. The concept of "going together" was the main philosophy and mission of this global forum, which was focused on promoting best or good practice in physical education through international cooperation.

Global communication and cooperation play significant roles in everyone's career, particularly physical education. Experiences from studying abroad gift one with the ability to identify and distinguish between the similarities and differences based on regions, cultures, countries, traditions, and values. GoFPEP 2014 enhanced my senses through engaging me in the presentations, local school visits, and group discussion sessions that elicited valuable and diverse information from experts from different countries. My experience taught me that despite constraints and barriers, health and physical education professionals in most countries

are dedicated to motivating their children and adolescents to go out and move to keep physically fit and mentally healthy. I found it interesting that some advantages are complementary to disadvantages. For example, risk management, which is currently perceived as the largest problem in teaching applications in China, is now well coped with in the United States. As a future physical education service provider, I should learn how to become a global citizen as the first step in the quest to go faster and further.

Conclusion

In conclusion, GoFPEP 2014 not only succeeded in the promotion of dialogue, exchange, and network-building in an interdisciplinary fashion, but also gave birth to a melting pot of cohesion and togetherness, a phenomenon best described in African terminology as *Ubuntu* (I am, because we are). To create global best practice in health and physical education pedagogy, professionals in this field must work together, learn from one another, help each other, and move forward together.

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