

Effects of Age and Experience on Physical Activity Accumulation during Kin-Ball

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In 2008, the United States Department of Health & Human Services released a document titled *Physical activity guidelines for Americans* (USDHHS, 2008). These guidelines suggest that children accrue at least 60 minutes or more of physical activity daily (most of which should be either moderate- or vigorous-intensity aerobic physical activity), and adults achieve at least 150 minutes a week of moderate-intensity (or 75 minutes a week of vigorous-intensity aerobic physical activity).

Concurrent with these recommendations, there has been an increasing emphasis placed on the development of comprehensive school physical activity programs that encompass physical activity programming before, during, and after the school day (NASPE, 2003). Even at the federal government level, legislation (PL 108-265) has been passed which requires all districts with federally funded school meal programs to develop and implement wellness policies. Given the shift towards the promotion of physical activity as a primary objective of physical education, a number of exploratory and intervention studies have examined the extent of activity accrued during physical education lessons. As an executive summary, the following key points are notable. First, while over 90% of American students in meet the objectives of Healthy People 2010, less than 3% actually meet Objective 22.6 which relates to bouts of continuous vigorous physical activity (Pate et al., 2002). Second, boys accumulate higher levels of physical activity than girls (McKenzie, Marshall, Sallis, & Conway, 2000). Third, students in grades 10-12 are significantly less likely than those in the younger groups to meet recommended activity guidelines. Forth, there is a decline in PA in girls during adolescence (Kimm, et al., 2002).

While fitness activities produce the most moderate to vigorous activity during physical education (McKenzie et al., 2000), many students report sports such as basketball, football,

bowling, swimming, and volleyball as their most preferred activities in contrast with aerobics, distance running and fitness (Hill & Cleven, 2005). Consequently, as Hill (2000) notes, physical educators should strive to discover and develop new and innovative ways to engage their students and create a more enjoyable atmosphere. In particular, identifying team sport games that engage all students in moderate to vigorous physical activity regardless of sex or skill level should be explored. Nonetheless, there has been a history of discriminative and abusive practices during game play in physical education (see Hastie, 2003).

With a specific agenda of wanting to create a fun activity that emphasized teamwork, cooperation, sportsmanship, Mario Demers, a Canadian professor of physical education, created Kin-Ball in the mid 1980's (International Kin-Ball Federation, 2009). The game involves three teams of four players in which a large ball (4 feet diameter and 2.2 pounds weight) is sent into space so that one of the other designated teams cannot retrieve it before it touches the ground (International Kin-Ball Federation, 2009).

Specifically, the team that has the ball chooses one of its opponents (usually the one that has the most points) by calling its color, preceded by "Omnikin" and then hits the ball towards a strategic place where the opponents will be least likely to retrieve it. At the time of the strike, all the players of the sending team must be in contact with the ball. If the nominated team does not succeed in catching the ball or if they make a mistake according to the game rules, a point is granted to *both* of the other two teams.

Currently, the International Federation of Kin-Ball has over 3.8 million registered participants in North America (Canada and the United States) Europe (Belgium, France, Spain, Denmark, Switzerland and Germany), as well as Asia (Japan and Malaysia) (International Kin-

Ball Federation, 2009). Nonetheless, there is no current research available concerning the sport with regard to physiological demand, skill acquisition, psychological aspects or sociological issues. Given the sport is becoming increasingly popular as a content area in physical education, together with the concern voiced by many in the field that students become more engaged in physical activity during their lessons, the specific question addressed in this study was: “To what extent does Kin-ball provide players/students the opportunity to accumulate Moderate to Vigorous Physical Activity?”

Method

Participants

A total of 130 Kin-Ball players participated in this study. These participants were part of three categorical groups, namely (i) level of experience, (ii) age, and (iii) sex. Level of experience was denoted as either “novice” (those who had not played the game before and required initial training) or “experienced” (those who were participating in formal leagues and who had played for at least one year). Three age categories were also used. Participants were either 10-11 years old, 14-16 years old, or 18-24 years old. Effectively, these groups correlated to fifth grade students, high school students, and university students. Table 1 presents the summary demographic information of the participants in this study. Informed consent was obtained from all participants.

Settings and Kin-Ball training for novices

Novice participants were from two elementary schools, two high schools, and two undergraduate classes at a university in the Southeastern United States. All students were from intact classes and the training and games took place during their regularly scheduled physical

education lessons. None of these participants had either played or even seen Kin-Ball played prior to the study. In order to ensure instructional fidelity, all participants received formal training in the basics of Kin-Ball prior to data collection. The extent of this training was determined by answering the question: “Do these students have the basic knowledge and skills that would allow them to play a “good” game of Kin-Ball?” A good game was one defined as a game where the referee does not have to stop the play for faults such as the same hitter serving twice in a row, an incorrectly formed pyramid (three people in contact with the ball), or a short hit (6 feet or less). That is, the role of the referee was to adjudicate boundaries and scoring.

Elementary school training. A 150-minute training was needed to reach the “good” level of play at the fifth grade level. In the first lesson, the students watched a video of a Kin-Ball game and began skill training. The following four lessons involved kinetic training that was broken down into two parts. The first part introduced the students to the catching, balancing, and hitting of the ball. The students practiced in a non-playing situation where they would catch, balance, and hit the ball in a continuous fashion to another team. In the second part, the students practiced in a play situation with appropriate calling and rules being followed just like high school and college participants did.

High school training. A 130-minute training was needed before the participants reached the “good” level of play before data collection. On the first day, the students watched the same Kin-Ball video as the elementary students and were also given the chance to understand kinetically the concept of the game and its basic rules. The following lessons consisted of a short practice which was used to reinforce a few rules followed by practice games.

University training. A 100-minute training was necessary to introduce the participants to the game and reach the “good” level of play. On the first day, the participants were shown the same Kin-Ball vignette video as the previous two groups, and then were presented with a handout that explained the game more fully. A few questions regarding rules were then clarified followed by ball familiarization skills. On the second day, the students were given the chance to more completely understand the concept of the game and its basic rules through a series of games.

Settings and Kin-Ball history of experienced players

The participants categorized as experienced were members of Kin-Ball leagues in Quebec, Canada. All these players had competed in at least one tournament and played in numerous league games. Each of these participants also practiced at least once a week during their competitive season.

Data Collection

During formal competition, a game of Kin-Ball is played over three, 15 minute periods. Hence, 15 minutes captures the essence of play within the context of a real game. For the purposes of consistency, data collection for the novice and experienced participants occurred during the first 15 minutes of an officiated game of Kin-Ball. Furthermore, most elementary school physical education lessons are 60 minutes or less in duration. Allocating 15 minutes to game play is a realistic expectation for lessons at this level that may also include fitness, management and other tasks.

In order to provide some measure of activity intensity, the System for Observing Fitness Instruction Time (SOFIT) instrument (McKenzie, Sallis, & Nader, 1992) was used to determine the extent of moderate-to-vigorous physical activity (MVPA). SOFIT is a momentary time sampling and interval (every 20 seconds) recording system designed to quantify physical activity levels and the opportunities children and youth have for physical activity in physical education classes. Numerous studies have shown that SOFIT provides valid and reliable measures in the populations in which it has been used (McKenzie et al., 1994; Rowe, Schuldheisz, & van der Mars, 1997; Rowe, van der Mars, Schuldheisz, & Fox, 2004).

Procedures for data collection in this study followed those prescribed in the SOFIT procedures manual (McKenzie, 2006). Specifically, we shifted from male to female across teams at one-minute observation intervals, (e.g. one male pink, followed by one female black, to one male blue, to one female grey etc), using 10-second observe, 10-second record intervals. Reliability between two coders reached 92% percent agreement based upon the formula: Percent Agree = (Total # Agree)/(Total # Observations) x 100. While the SOFIT instrument allows for an analysis of contextual and teacher behavioral variables within a physical education lesson, we did not examine actual physical education instruction, but simply game play. As a result, these variables were not included in the analysis.

Data Analysis

A 2 (experience level) x 2 (sex) x 3 (age) analysis of variance (ANOVA) was employed to determine any differences in the extent of time the players spent in standing, walking and running. Alpha level was set at .05 a priori and SPSS version was used to analyze the data.

Results

Figure 1 shows the time spent in the various physical activity categories during a 15-minute period of Kin-Ball. Across the entire sample, 72.3% of the game time involved participants in MVPA (45.6% walking and 26.7% very active). It should be noted that there were no instances of lying down or sitting.

No significant differences were found for either age $F(1,11) = 2.13, p > .05, \eta^2 = .415$, sex $F(1,11) = .79, p > .05, \eta^2 = .056$, or level of experience $F(1,11) = .48, p > .05, \eta^2 = .073$ on MVPA, although the more experienced players had more MVPA in very active versus walking $F(1,11) = .686, p > .05, \eta^2 = .533$. Experienced players spent 26.7% of game time being very active, compared with 18.7% of game time for novice players.

Discussion

The purpose of this study was to determine the amount of physical activity achieved during Kin-ball play. The results showed that across all age groups and experience levels approximately 70% of game time was spent in MVPA. Given the goal that students achieve 33-50% of their lesson time in MVPA (COPEC, 2004; USDHHS, 2000), it would seem from the results of this study that participation in Kin-Ball can provide one activity that reaches these targets. Of course, this claim is somewhat tempered by the small cell sizes of the participant pool.

Accumulated MVPA during Kin-Ball did not differ between sex and age. Previous scholarship of children and adolescent physical activity correlates has shown that sex was the most important demographic correlate of physical activity for this age group (Sallis, Prochaska, & Taylor, 2000). Based on the results of this study, Kin-Ball would appear to be a suitable activity for physical education curriculum in K-12 and college to eliminate the disparity between

males and females with regard to physical activity. Furthermore, the amount of training time was minimal for all age groups (100-150 minutes). While the game itself involves only nine^[F1] players, a typical class in many physical education settings could comfortably accommodate two games. Another common alternative during a Kin-Ball unit (and most other team sports) could be the inclusion of small group lead-up activities using smaller training balls to engage students in high levels of physical activity.

As a result of the increased prevalence in obesity levels and hypokinetic diseases, it is important that we identify activities that appeal to a large range of individuals while targeting the correlates of physical activity engagement. Important psychological, social and environmental correlates of physical activity for children, adolescents and adults include: physical activity enjoyment, parental support, social support, opportunities for physical activity, community support for physical activity, access to exercise facilities and time outdoors (Gordon-Larsen, McMurray, & Popkin, 2000; Trost, Owen, Bauman, Sallis, & Brown, 2002; Sallis et al., Prochaska, & Taylor, 2000). Kin-Ball would be an option to target this array of correlates in physical education. Moreover, Kin-Ball could extend past the physical education experience and provide a recreational activity offered in recreational leagues or community activities, thereby, providing additional access to physical activity.

It was of interest to note the significant influence of experience level, with experienced players spending more of their active movement in the very active category. These differences may be explained in that as players become more familiar with the game, they become more efficient in their decision making. As Mann, Williams, Ward, & Janelle (2007) note, experts are superior to nonexperts in picking up perceptual cues, as revealed by measures of response accuracy and response time. This improved response selection may have resulted more quick

movement to the appropriate places on the court. Nonetheless, this finding is a positive outcome for physical education in that we have a baseline where students are achieving the stated activity goals, but with practice and experience, this goal is enhanced by the increases in levels of vigorous activity. In future studies it would be interesting to see if novice and experienced participants in other activities used in the physical education curriculum make such changes. Take as an example badminton. Novice students frequently have short rallies with a lot of misses until a point where they develop significant object control, and then as these rallies become more cooperative, they lengthen. With skill improvements, rallies again become shorter as players use more sophisticated skills and tactics to end rallies, until finally, at the elite level, rallies can last more than or crossings of the net (Hastie, Sinelnikov & Guarino, 2009). In conclusion, the result of this study would suggest that Kin-Ball is an activity that would be appropriate for physical education. Incorporating Kin-Ball into a physical education environment provided equal opportunities for physical activity for males and females, regardless of age and level of play. Furthermore, Kin-Ball provided a fun group activity in physical education while meeting the physical activity recommendations.

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Table 1

Participant Details

Category	Males	Females
	<i>N</i> (M±SD years of age)	<i>N</i> (M±SD years of age)
Novice		
5 th grade	12 (11.3±.51)	12 (11.1±.29)
High school	12 (15.3±1.31)	12 (16.4±1.04)
University	14 (21.5±.67)	10 (21.8±1.46)
Experienced		
5 th grade	12 (11.5±.94)	12 (10.5±.25)
High school	6 (15.2±.44)	5 (13.4±.42)
University	12 (20.3±1.27)	12 (23.2±.94)

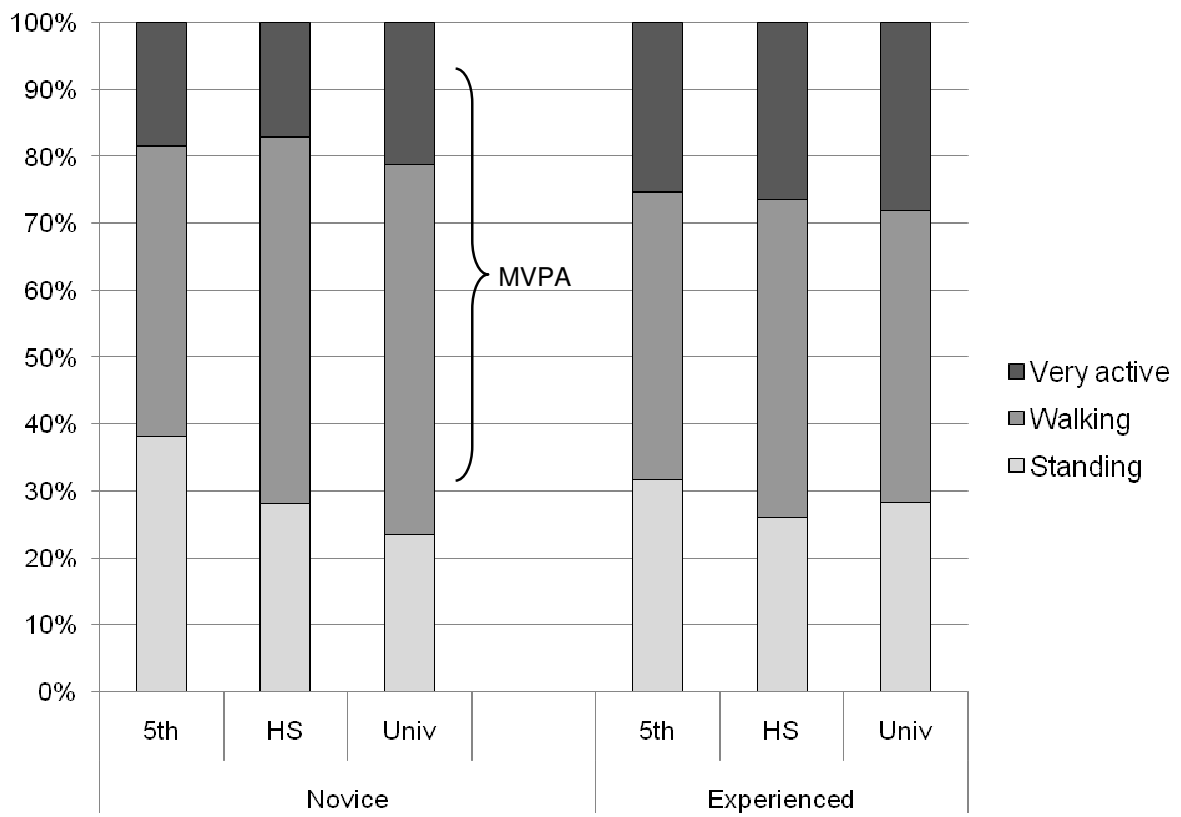


Figure 1. Percentage of physical activity during a 15-minute period of Kin-Ball.