

The Different Involvement of Kinect Games in Physical Education Courses Effect on the Baseball Batting Skill Learning Performance of High School Students

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0821

The Asian Conference on Society, Education and Technology 2013

Official Conference Proceedings 2013

Abstract

The purpose of this study was to discuss the different involvement of Kinect games in high school physical education courses. The researchers investigated 4 classes for 8-week physical education courses. In the class I, the teacher gave a brief introduction for batting skills and the students practiced batting skills by using baseball batting games from Kinect. In the class II, the teacher applied different upper limbs exercise games from Kinect including baseball, tennis, finishing and skiing indirectly to teach students the batting skills. In the class III, the teacher applied tee ball as a teaching instrument to let students practice baseball. The class IV, the students as a control group were taught by the whole body exercises, such as running and swimming. The researchers measured all students on the baseball batting skill learning performance by the batting distance at the beginning and the end of 10-week practice. Pretest and posttest were administered by employing a baseball batting tee. The results found out the students who enrolled in the classes with Kinect baseball batting games showed more significantly improvement on batting distance than in the tee ball group and the control group. The findings of this study indicated use Kinect as teaching instrument can enhance the batting performance. Involving kinect games differently can assist teachers to reach different teaching goals in physical education.

Keywords: e-learning, Physical Education, Kinect, motion-sensor game

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Background

There are three student-centered models to learning in Physical Education: Sport Education (SE), Tactical Games (TG), and Cooperative Learning (CL) (Ben, 2004). SE, TG, and CL can provide structures or instructional model for situation learning based on the meaningful, purposeful and authentic learning activities. The students should be considered when implementing three instructional models: the teacher is a facilitator, students are active learners, and students work in small groups and modified games, learning activities are interesting and challenging, and students are held accountable.

Educational games are designed for specific educational goal and focused on specific pedagogical aspects. Educational games are less available to compare with normal games. Those are leaving the user in a passive role and control the game (Daniel Burgos, Colin Tattersall, & Rob Koper, 2007). When using games in e-learning, it's important to re-purpose generic games by teachers and educational technologists. It can be used in different e-learning platforms and environments. Pedagogy, and structured resources, files and links are combined to form Units of Learning (Koper & Tattersall, 2005).

There are several key points to hit the ball. Firstly, balance is the most important, the rotation of the batter's center of gravity. Secondly, through the hip rotation, the batter's weight shifts from the backside forward to the front side. When the swing, the moving of hands should be like a pendulum, and remain inside the ball (Walter, 2002). To complete the swing, the hitter extends his full arm. The hands should be in the palm-up and palm-down positions. When the hitter follows through to extension, and balance to the end posture. The follow-through motion is also an important point to hit the ball (Figure 1).

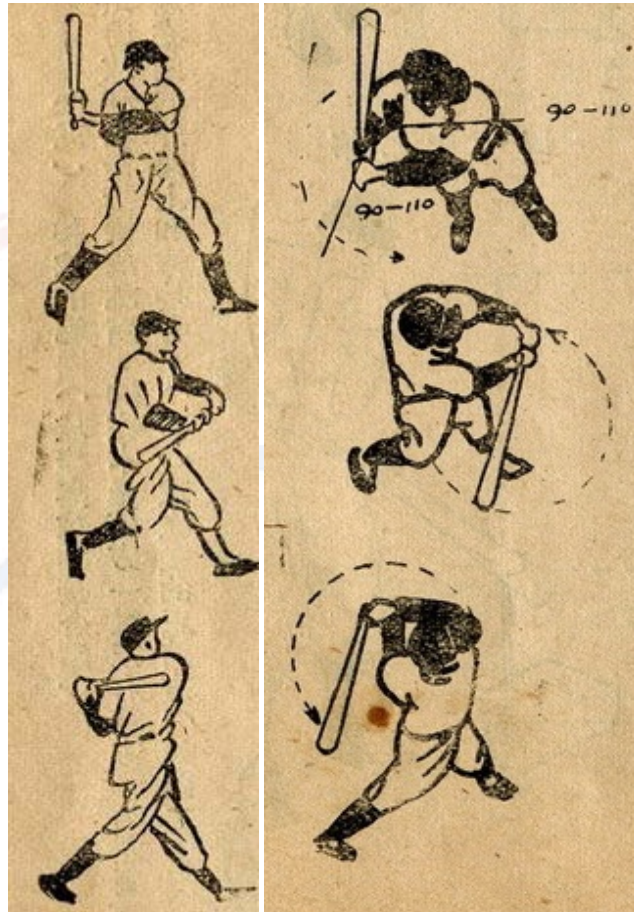


Figure 1. The full motion to hit a ball

Reference: 國防部(1954)。棒球初步。台北市：國防部。

The players should work on the quick, compact stroke, using the mechanics of positive procedures. The batting-tee drill can be used as a tool. The players can use a weighted bat and a fungo bat 100 times a day with each hand. That's 400 swings a day and more than 2000 swings each week. That can make the player keep muscle power and fitness. The players should perform the skills repetitively, and practice hitting against quality pitching (Walter, 2002).

Kinect is a motion sensing input device by Microsoft for the Xbox 360 video game console and Windows PCs. Based around a webcam-style add-on peripheral for the Xbox 360 console, it enables users to control and interact with the Xbox 360 without the need to touch a game controller, through a natural user interface using gestures and spoken commands. The Kinect sensor is a horizontal bar connected to a small base with a motorized pivot. The device features an "RGB camera, depth sensor and multi-array microphone running proprietary software", which provide full-body 3D motion capture, facial recognition and voice recognition capabilities. The depth sensor consists of an infrared laser projector combined with a monochrome CMOS

sensor, which captures video data in 3D under any ambient light conditions. The sensing range of the depth sensor is adjustable, and the Kinect software is capable of automatically calibrating the sensor based on game play and the player's physical environment, accommodating for the presence of furniture or other obstacles. The software technology enables advanced gesture recognition, facial recognition and voice recognition. Kinect is capable of simultaneously tracking up to six people, including two active players for motion analysis with a feature extraction of 20 joints per player (Xbox, 2013).

Kinect Sports: Season Two consists of six sports which can be accessed from the main menu, which can be played in single or multiplayer: golf, darts, baseball, skiing, tennis, and American football. The games are controlled through Microsoft's Kinect device, which allows players to control the game through gestures and speech recognition without the need of any physical game controller. The player controls the sports by mimicking how the sports are played in real life without the equipment that usually is associated with them (Xbox, 2013). Baseball game from Kinect Sports: Season Two has several rules. Two players play the role as a batter and a pitcher. When catching high fly ball, the player also plays as an outfielder. One of the player get 2 scores continually, the one wins the contest and the game is over. The batter can choose left-handed or right-handed. Strike is existed, no balls. 3 times strike makes the player strike out. When the batter hit the fly ball, the outfielder can't catch the ball, the player will be put-out. Otherwise, the player will be hit.

The purpose of this study was to discuss the different involvement of Kinect games in high school physical education courses. To find out the students in Kinect baseball program, the students in Kinect mix exercise program, the students in Tee ball program and the students with traditional education program whether the differences in the hitting distance. Through the pre-test and post-test, the students in each course could be progress or regress in hitting distance. The result of this study could be proved that e-learning is effective to help teaching baseball. Kinect or other motion controller can be used as physical education instruments in the future. The purposes are following:

1. The different time involvement effect on batting distance and distance improvement
2. The different batting motion practices effect on batting distance and distance improvement

Method

The researchers investigated 4 classes for 8-week physical education courses, 3 hours per week. The number of participants and intervention in each class showed on Table 1. The Participants are high school students in Tainan, Taiwan, who are 14-15 years old. In the class I, the teacher gave a brief introduction for batting skills and the students practiced batting skills by using baseball batting games from Kinect. In the class II, the teacher applied different upper limbs exercise games from Kinect including baseball, tennis, finishing and skiing indirectly to teach students the batting skills. In the class III, the teacher applied tee ball as a teaching instrument to let students practice baseball. The class IV, the students as a control group were taught by the whole body exercises, such as running and swimming.

The researchers measured all students on the baseball batting skill learning performance by the batting distance at the beginning and the end of 8-week practice. Pretest and posttest were administered by employing a baseball batting tee. The students hit the baseball batting tee for 10 times. And then, the longest distance is estimated for pretest or posttest.

Table.1 The Number of Participants and Intervention in Each Class

Class	Intervention	N
I	Baseball Game from Kinect Sports: Season Two	31
II	Baseball, tennis, finishing and skiing games from Kinect Sports: Season Two	27
III	Tee Ball	35
IV	Control Group	35
Total		128

Result

128 students in this experiment were assigned to 4 classes. 31 students (16%) were in class I, 27 students (13.9%) were in class II, 35 students (18%) were in class III, and 35 students (18%) were in class IV. The longest distance in pretest is 26.97 ± 11.09 m, and there is no significantly difference between all classes ($F(2, 126) = 0.40, p = .75$). The longest distance in post-test is 26.97 ± 11.09 m, and there is no significantly different between all classes ($F(2, 126) = 0.87, p = .74$). Moreover, the distance difference between pre-test and post-test is significantly different in Class I > III, IV ($F(2, 126) = 2.95, p < .05$). Table 2 shows more details.

Table. 2 ANOVA analysis of Pre-test, Post-test distance and distance improvement

	Class	N	MEAN	SD	F
Pre-test Distance	I	31	27.87	10.50	0.40
	II	27	24.94	12.72	
	III	35	27.14	11.13	
	IV	35	27.57	10.49	
	Total	128	26.97	11.09	
Post-test Distance	I	31	33.62	13.70	0.87
	II	27	28.31	17.17	
	III	35	28.29	16.70	
	IV	35	28.66	14.75	
	Total	128	29.69	15.58	
Distance improvement	I	31	5.75	5.64	2.95 *
	II	27	3.37	6.61	
	III	35	1.14	9.66	
	IV	35	1.09	6.45	
	Total	128	2.72	7.51	

Therefore, we divided all students in classes into 2 groups, regress group and progress group. The regress group was assigned students whose hitting distance in pre-test was longer than in post-test. On the contrary, the progress group was assigned students whose hitting distance in post-test was longer than in pre-test. The result showed significantly difference in Class I and II ($\chi^2(3) = 13.64, p < .05$). In both class I and II, more students are in progress group than in regress group. The baseball game from Kinect was used in both class I and II. The Kinect can improve the students' performance in hitting distance.

Table 3. Chi-square analysis of regress group and progress group

Class		Regress Group	Progress Group	Total	
I	Count	5	26	31	$\chi^2=13.64^*$ $Df=3$
	% within Class	16.1%	83.9%	100.0%	
II	Count	7	20	27	* $p<.05$
	% within Class	25.9%	74.1%	100.0%	
III	Count	19	16	35	
	% within Class	54.3%	45.7%	100.0%	
IV	Count	17	18	35	
	% within Class	48.6%	51.4%	100.0%	

Discussion

The difference on practicing follow-thought motion

There were more progressive students in the Kinect baseball game group and the Kinect mix game group. No matter the courses were integrated with only baseball games or with four-type sport mix games. In the Kinect game groups, a batter had to complete hit motion to hit the ball, so that the ball would be hit far and hard to catch. If the motion was incomplete, the Kinect would determine as strike or foul ball. The students in the Kinect baseball game were through the same playing pattern, so the students had to complete their hitting motion to achieve the goal. As a batter, the students had to complete hit motion to hit the ball, so that their balls would be hit far and hard to catch. If the motion was incomplete, the ball would be strike or foul ball. Therefore, the students practice more time than other groups. Their skills became more mature, so their performances were progressive obviously. Although, the class in only Kinect baseball game had more chance to practice the hitting skill than the mix games. The mix games were through the same playing pattern, the students also had to complete their hitting motion to achieve the goal. Therefore, the students in Kinect mix game were also improve their performance.

As for Tee ball group, it should be a good tool in teaching baseball. It was similar to baseball, including the concept, the rule, the tools, or others. However, we observed that the students hit the ball without the follow-thought motion. They just finished the swing phase after the ball was batted. The incomplete motion was the main point not to make progress in the students' hitting distance. The result provided evidences to support the completing batting motion to enhance the batting distance in the baseball handbook (Walter, 2002).

The difference on practicing frequency among different groups

The students in Kinect baseball game improved more hitting distance than others. The students in Kinect baseball game group practiced more than 15 times to hit balls in an hour, but others only practice 3-5 times an hour. Walter (2002) said that's 400 swings a day and more than 2000 swings each week. The frequency of practices is important to a good batter.

Suggestion

The follow-through motion is an important point to hit the ball. More chances to practice is the key to improve the batting skill, either. Motion sensor games can be used as assisted tools to practicing the whole process in physical education. The Kinect can be used as an instrumental in teaching baseball to increase practicing chances.

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