THE EFFECTS OF A DISTANCE LEARNING COMPUTER PROGRAM ON ERROR DETECTION OF THE OVERHAND THROW BY PRESERVICE ELEMENTARY EDUCATION TEACHERS

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Abstract

The purpose of this project was to (a)determine if computer-based distance learning could enhance the qualitative analysis skills (error detection in the overhand throw) of preservice elementary education teachers and (b)examine the efficiency of several methods of information presentation (video file and text) on distance learning. Sixty-four participants were randomly assigned to 1 of 4 groups. The task for each group was to detect errors in an incorrect throwing motion as exhibited by a model on the computer screen. A one-way analysis of variance (ANOVA), $F(3, 60) = .28$, $p = .842$, confirmed no significant differences between groups on the pretest (Day 1). Days 2 through 8 served as treatment and testing sessions and five days after the final treatment/testing session the participants were involved in a retention test. Group 1 (n=16) acted as the control, group 2 (n=15) viewed a video capture of the appropriate throwing mechanics; group 3 (n=17) viewed text information describing the appropriate mechanics of the overhand throw, and group 4 (n=16) received a combination of video capture and written information. An ANOVA with repeated measures indicated a significant time effect, $F(8, 480) = 128.33$, $p < .001$. A series of paired sample t-tests between the pretest values and the posttest values revealed that the only group to show significant learning effects over time was the video plus text group $p = .005$.

Introduction

Distance learning began in the 1800's with correspondence courses and saw few changes during the first eighty years, but with the advent of new technology (i.e. personal computers and access to the Internet) has rapidly evolved in the last 20 years. The development of software programs has

resulted in the frequent use of computer-assisted instruction for on and off campus classes, and there are websites devoted to teaching both cognitive and motor skills. St. Pierre (1998) suggested that distance learning might benefit students since it provides individual instruction, educational opportunities in rural areas, and availability to those already in the field. He also mentioned that distance learning is evolving toward individualized instruction that takes into account student learning patterns and effective pedagogical strategies.

Several studies (e.g., Adams, Kandt, Throgmartin & Waldrop, 1991; Hosinski, 1966; Kerns, 1989; Walkley & Kelly, 1989) found no significant differences when comparing computer-assisted instruction with the traditional teacher-directed method of instruction. The lack of significant differences would suggest that computer-assisted instruction is an effective alternative to the teacher-directed method of instruction. Kerns (1989) conducted a study to assess the effectiveness of computer-assisted instruction in teaching tennis rules and strategies. She found that both groups showed significant learning of tennis rules and strategies from pre test to post test, but there was no significant difference between the performance of either group on all three testing occasions. This suggested that CAI used outside of class would allow more time for instruction of tennis mechanics, more opportunity to practice skill, and/or more playing time. Kulik and Kulik (1986) found that computer-assisted instruction reduced the amount of instructional time required which supported an earlier study by Hosinski (1966) that showed traditional classroom procedure required twice the instructional class time as the computer-assisted instruction.

Non-verbal instructional techniques such as videotape replay, television and video-disc have been available for a number of years, but it is just recently that a distance learning paradigm has become an option. With the advent of software programs that allow an instructor to capture and use video files, provide written instructions, and receive test results via online transmission, the need for research into the efficacy of such treatments seems implicit. Although no studies were found examining the optimal use of video files in a computer-based distance learning environment, one might consider generalizing from the findings of research dealing with the use of videotape replay.

With its ability to provide precise and almost immediate feedback,

videotape replay was considered a logical method of presenting kinematic information. Cooper and Rothstein (1981) found higher achievement test results (tennis serve) among those using videotape versus a control group, and Rikli and Smith (1980) found that service form improved as a result of using videotape replay. However, when Emmen, Wesseling, Bootsma, Whitling and Van Wieringen (1985) and Van Wieringen, Emmen, Bootsma, Hoogesteger and Whiting (1989) compared performance and movement scores of novice and intermediated tennis players respectively, there was no significant difference between those using videotape and those not using videotape. Walkley and Kelly (1989) found that an interactive videodisc qualitative assessment training program was as effective as a teacher-directed approach for the overhand throw and superior to the teacher-directed approach for the catch. The success of many of the studies completed after 1976 may be due to information provided by Keele and Summers (1976) and Rothstein and Arnold (1976). Keele and Summers (1976) attributed the failure of many studies utilizing videotape to a reliance only on the videotape or the use of a model, rather than a combination of the two. They argued that a model aided in the development of a template, but provided inadequate performance feedback for comparison. Video, without an adequate template, is less effective because there is no standard of correctness against which to evaluate the feedback. According to Bandura's (1969) social learning theory, acquisition of action patterns is mediated by a common conception-matching process. This approach suggests that motor learning involves the construction of a conceptual representation which provides the internal model for response production, and which serves as the standard for response execution. The conceptual representation is constructed by transforming observed sequences of behavior into symbolic codes which are cognitively rehearsed to increase the probability of their retention. Magill (2001) stated that "a common guiding principle for demonstrating a skill is that the demonstrator should perform the skill correctly" (p. 224). Morrison and Reeve (1989) said than "when improvement in qualitative analysis is considered alone, seeing good examples only led to better performance than seeing good and bad examples" (p. 114).

Rothstein and Arnold (1976) conducted an extensive literature review and suggested the lack of cue utilization as an attention focusing mechanism may have had the most significant effect on the use of videotape replay.

Newell & Walter (1981) indicated that the amount of information available via videotaped replay is more than the subject can effectively process. The lack of an attention focusing mechanism (cues) may have limited the learners' ability to focus attention on the relevant information and ignore the irrelevant stimuli. Several studies (e.g., Ball & Sekuler, 1981; Johansson, 1973) have shown that with its ability to reduce uncertainty, enhance motion detection and focus the learners' attention upon the minimal yet relevant aspects of the movement; cue utilization might be the logical choice. Consequently, it is not a great surprise that Rothstein and Arnold (1976) found studies utilizing cueing had a much higher ratio of success.

Across the United States, classroom teachers, rather than trained physical education teachers, are often charged with the responsibility of teaching physical education (Allison, 1990; Pangrazi, 1997). Only 7 states require that physical education be taught by certified physical educators and 39 states use a combination of physical educators and elementary education classroom teachers (NASPE, 1997). Faucette, McKenzie and Patterson (1990) suggested that physical education specialists provide more effective physical education instruction than nonspecialists. Placek and Randall (1986) found that when compared to nonspecialists (not trained in physical education), specialists spend more time on skill practice than game play. This is not necessarily because nonspecialists are incapable of skill analysis, but could be due to the lack of training in qualitative skill analysis (the systematic observation and introspective judgement of the quality of human movement for the purpose of providing the most appropriate intervention to improve performance) by the nonspecialists.

In fact, Biscan and Hoffman (1976) suggested that skill analysis is not an ability limited to physical educators. Osborne and Gordon (1972), using experienced and inexperienced tennis players, found that performance ability did not lead to analytical ability. Morrison and Reeve (1988) conducted a study examining the effect of instruction and undergraduate major on qualitative skill analysis and found no significant differences between elementary education majors, elementary education/physical education majors and sports science majors. Clearly, the learning needs in the area of qualitative sport skills analysis for a prospective classroom teacher/physical educator is as great or perhaps greater than a prospective physical educator. One logical extension of the use of technology would be the use of a

computer-assisted distance learning environment to provide preservice elementary education teachers with information needed to enhance their qualitative analysis skills.

The purpose of this project was to (a)determine if computer-based distance learning could enhance the qualitative analysis skills (error detection in the overhand throw) of preservice elementary education teachers and (b)examine the efficiency of several methods of information presentation (video file and text) on distance learning. It was hypothesized that there would be a significant learning effect and that the video plus text group would show greater learning over time and perform at a significantly higher level than the other three groups on a retention test.

Method

Participants

The participant pool included 10 males and 54 females who were enrolled in a university undergraduate physical education teaching methods class designed for elementary education majors. Participants were randomly assigned to one of the following four groups: control (n=16), video (n=15), text (n=17), and video plus text (n=16). The groups began with equal numbers (n=17), but due to illness several participants had to drop out after data collection had begun. All participants taking part in this investigation signed consent forms and were treated in accordance with the "Ethical Principles of Psychologists and Code of Conduct" (American Psychological Association, 1992).

Apparatus

The instructional software was developed using Asymetrix Toolbook II Assistant for PC computers which is an authoring environment producing interactive instructional software. The finished software was a hybrid distance learning instructional and testing package. Students used instructional software from computer labs on campus, and submitted their test answers to an Internet site accessed within the instructional software.

Efforts were made to keep the computer screens simple. The background colors were light with black text, which is consistent with the suggestion of Lee and Boling (1999) that high contrast between letters and background improves legibility and readability. The Arial font in a 10 point size was used

to provide text information to the students. The main screen included nine menu buttons corresponding to each of the 9 days of treatments. Buttons which linked to the pretest, treatments or post test were labeled, "Day One, Day Two," etc. (Students were provided with specific dates on which to take treatments and tests in the user's guide).

When participants clicked on a particular button to access the group treatment information, they were presented with a screen which specified the sequence in which the skill was to be studied. The same group treatment information was presented on each day of instruction. The information differed (i.e. the text group instructions contained no reference to video, the video group contained no reference to text information, and the video and text group contained information regarding both text and video) from one treatment group to another.

According to Lee and Boling (1999) one should "be consistent in the screen appearance, location, and behavior of screen elements and ensure that screen elements with similar functions share similar appearance, location, and behavior" (p. 23). The screens for instruction were all arranged in the same manner and included buttons, a scrollable text box, and a media player (10.16 cm X 10.16 cm) for the playback of video files. The media player for the video group was operable, but the text box contained a message, "No Text". Information descriptions were provided in the scrollable text box for the text group and the media player contained a message, "No Video". The text box and the media player were fully functional for the text plus video group Once participants finished the learning sequence, they clicked on a test button to access the testing screen and were presented with standardized information describing sequences for viewing the test video. The test screens and video were the same across all treatment groups. After viewing the test video, participants submitted their answers to an Internet site by clicking on a button at the bottom of the screen.

Video clip models The model demonstrating the biomechanically correct and incorrect throws was a physical education major who previously modeled the overhand throw for other studies. Prior to filming the video clip, the model was required to practice 50 throws a day receiving error correcting instructions from an expert until it was determined that the throwing motion exhibited the characteristics of a biomechanically correct throw. The parameters defining a correct throw were obtained primarily from Roberton's

(1978) developmental sequence. The same procedure was followed prior to filming the individual phases of the correct throw. Specifically there were video tapes of the preparatory phase (movements are directed away from the line of projection), the execution phase (movements are performed along the line of projection), and the follow through phase (movement follows release of the ball).

Following the videotaping of a correct performance of the overhand throw by the model, specific errors were introduced to selected components of the overhand throw. Seven different incorrect performances were video taped by the investigators. Again, the model was trained until capable of demonstrating the specified errors.

The video tapes were recorded from a distance of 30 feet at a 45 degree angle on the model's dominant side (right side). Each of the tapes illustrated only the throw with limited video of the flight of the ball following release by the model.

Procedure

Pilot study of the software A pilot study was conducted to ensure the function of the software, validate the user-friendliness of the software, receive feedback on the usefulness of the User's Guide (which illustrated in chronological sequence screen captures augmented by a text description that enhanced access and navigation in the software), and test the software links to the Internet data reporting site.

Seventy-two elementary education majors took part in the pilot test. The following changes were made to the Users' Guide based upon feedback from the pilot study: 1) add a participation log so that students could check off progress after each treatment and testing session, 2) add technical support telephone numbers in the event an unexpected problem occurred while using the software, and 3) what to do if events such as logging on to the wrong treatment group occurred. Feedback from the pilot study also validated the intuitive user interface of the software.

Prior to the implementation of the treatment procedures, participants took part in an orientation to the software using an IBM Thinkpad 390 E laptop computer in concert with an Epson 5000 series data projector. Participants were provided a copy of the user's guide, trouble shooting information, location and availability of academic computing labs, and a participation log designed to aid them in maintaining the specified sequence for learning experiences.

Treatments Participants received the revised Users' Guide and took part in the orientation program used during the pilot study. The control group received no instruction. In accordance with McGuire's (1961) suggestion that 3 to 5 exposures would allow for better retention of the information, the participants were provided 3 exposures to the treatment information. Therefore, excluding the pretest and the post test, the groups viewed a video file, played on the media player, of a biomechanically correct throw three times (regular speed, slow motion and regular speed) prior to taking the test. Those receiving text descriptions read the descriptions three times.

In an attempt to reduce the load on the information processing system, information about the phases of the throw were systematically added over a three day period. On Day 2 the participants in the video group viewed only the preparatory phase, Day 3 the preparatory plus execution phases, and on Days 4 through 8 the preparatory plus execution plus follow through phases. The text group read written information describing the throw three times prior to taking the test. On Day 2 the information was about the preparatory phase, Day 3 the preparatory plus execution phases and on Days 4 through 8 the preparatory plus execution plus follow through phases (see Appendix A for a description of the text information). The video plus text group viewed the video at each speed and read the text prior to each replay. The presentation of information followed the previously mentioned pattern of preparatory phase on Day 2, preparatory plus execution phases on Day 3 and preparatory plus execution plus follow through on Days 4 through 8.

Testing procedures All groups were pretested on Day 1 by viewing, identifying and describing perceived errors depicted by the model. The errors depicted were the same for all groups. This procedure was replicated on Days 2, 3, 4, 5, 7, and 9 (retention test) with the only difference being the errors depicted by the model. The retention test occurred 5 days after the testing on Day 8. All groups were tested on days 6 and 8 by viewing a model of the overhand throw with no errors. The requirement of 3 views was based upon McGuire's (1961) study suggesting 3 to 5 views to be optimal. The first and third viewings of the model were seen in regular speed. The second viewing required the participant to manipulate the slider bar on the media player to see the model in slow motion. Once this process was completed, the participant launched a web browser which defaulted to a

data collection site. Participants were then required to identify their group, test number, enter their name and then enter their data by writing a description of the error, either in full sentences or phrases. There were five errors depicted during each test video, except for Day 6 and Day 8 when the modeled throw was biomechanically correct. A list of these errors can be found in Appendix B. Once all data were presented, it was submitted to the data collection web site. This procedure was followed for each of the nine testing days.

Scoring procedures The pilot study was used to establish the inter observer reliability of scorers. One of the researchers has a doctoral level degree in biomechanics with previous research experience with the overhand throw. The second researcher has an Ed.D. degree in elementary physical education with a strong background in movement skill analysis and the third researcher has an undergraduate degree in exercise physiology with a strong emphasis with movement skill analysis. An interrater reliability coefficient of .91 was established by using the following procedure. After retraining in the biomechanical principals of the overhand throw, the raters viewed randomly selected video tapes of the model performing incorrect throws. The raters then described each of the errors they viewed based upon the errors depicted by the model. Scores were compared and discrepancies were discussed. This process continued until an acceptable interrater reliability (i.e. .91) was achieved. The mean of the three observers was utilized when deriving the test scores.

The scores for the participants were awarded on the following basis: For all days except Day 6 and Day 8 participants were awarded one point for each error detected up to a maximum score of 5. Because no errors were depicted by the model on Day 6 and Day 8, one point was subtracted from a maximum of 5 each time an error was described by the participant.

Results

Data Analysis

Data analysis was conducted using the SPSS 9 statistical software package. The results of a one-way ANOVA, $F(3, 63) = .28$, $p = .842$, conducted as part of a pretest showed no significant between group differences.

Table 1: Instructional Groups and Test Results Means and Standard Deviations

Tests	Control		Video		Text		Text & Video	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Day 1	.88	.89	.93	.70	.88	.70	.69	.95
Day 2	.75	.77	.73	.80	2.29	.85	2.25	1.44
Day 3	.00	.25	.13	.35	.59	.71	.94	.68
Day 4	.19	.54	.20	.41	.88	.78	1.19	.05
Day 5	1.13	.81	1.13	.99	1.71	1.05	2.06	1.29
Day 6	3.31	1.82	3.53	1.51	3.94	1.30	4.12	1.09
Day 7	.69	.79	2.00	1.60	.94	1.03	1.62	.81
Test 8	3.81	1.60	3.80	1.42	4.18	1.19	4.56	1.03
Day 9	.87	.50	.93	.80	1.12	.99	1.88	1.02

A one-way within-subjects ANOVA with repeated measures was conducted with the factor being the method of instruction and the dependent variable being the pretest scores, post-instruction test scores and the retention scores. The means and standard deviations for the pretest, post-instruction test scores and the post test/retention scores are presented in Table 1. The results for the ANOVA indicated a significant time effect Wilks' $\Lambda = .11$, $F(8, 53) = 55.57$, $p < .001$., as well as a significant time by group effect Wilks' $\Lambda = .40$, $F(24, 154) = 2.39$, $p = .001$. Follow-up analysis using Tukey's HSD showed significant differences existed between the text instructional group and the control group $p = .025$, the video and text instructional group and the control group $p < .001$,and the video plus text and the video group $p = .006$.

Results of a one-way ANOVA conducted on the retention test scores showed a significant between group difference, $F(3,63) = 4.60$, $p = .006$. A follow-up analysis using Tukey's HSD showed significant differences between the video plus text group and the control $p = .009$ as well as the video plus text group and the video group $p = .017$. Although there was no significant difference between the video plus text group and the text group there was a trend towards significance $p = .065$.

Table 2: All Groups Pretest and Postest Comparisons

Group	Mean	SD	t	df	p
Group 1	.00	.97	.00	15	1.00
Group 2	.00	.85	.00	14	1.00
Group 3	-.24	.90	-1.07	16	.30
Group 4	-1.20	1.42	-3.34	15	.05

Paired-samples t test were conducted to evaluate whether there were significant differences between the pretest and post test scores. The results (see Table 2) indicated that only the video plus text group pretest and post test mean scores were significantly different $p = .005$.

Table 3: All Groups Day 6 Paired T-Test Comparisons

Pairs	Mean	SD	t	df	p
Day 1/Day 6	-2.89	1.63	-14.15	63	.01
Day 2/Day 6	-2.20	1.70	-10.36	63	.01
Day 3/Day 6	-3.30	1.60	-16.48	63	.01
Day 4/Day 6	-3.11	1.70	-14.63	63	.01
Day 5/Day 6	-2.22	1.68	-10.59	63	.01
Day 7/Day 6	-2.44	1.73	-11.30	63	.01
Day 8/Day 6	0.36	.95	3.03	63	.04
Day 9/Day 6	- 2.53	1.67	-12.12	63	.01

Paired-samples t tests were also conducted to compare the group mean scores of Day 6 and Day 8 against the mean scores of all other tests (Days 1-5, Day 7 and Day 9). The results (see Table 3) indicated that Day 6 mean scores were significantly different from all other test scores, and Day 8 mean scores (see Table 4) were significantly different from all other test scores, including Day 6.

Table 4: All Groups Day 8 Paired T-Test Comparisons

Pairs	Mean	SD	t	df	p
Day 1/Day 8	-3.25	1.60	-16.21	63	.01
Day 2/Day 8	-2.56	1.66	-12.34	63	.01
Day 3/Day 8	-3.66	1.36	-21.52	63	.01
Day 4/Day 8	-3.47	1.57	-17.64	63	.01
Day 5/Day 8	-2.58	1.56	-13.21	63	.01
Day 6/Day 8	-0.36	0.95	-3.03	63	.004
Day 7/Day 8	-2.80	1.54	-14.58	63	.01
Day 9/Day 8	- 2.89	1.47	-15.72	63	.01

Discussion

One purpose of this project was to determine if computer-based distance learning could enhance the qualitative analysis skills (error detection in the overhand throw) of preservice elementary education teachers. The results of the paired-samples t test showed that the video plus text group did show a significant learning effect over time. Although limited to the one successful treatment, this does suggest that a computer-based distance learning paradigm can be effective in the acquisition of qualitative analysis skills, and supports St. Pierre's (1998) proposal that distance learning is evolving toward individualized instruction that takes into account student learning patterns and effective pedagogical strategies.

Paired-t test results also showed that participants across all groups were much more proficient at identifying a performance that contained no errors as opposed to identification of specific errors. One might infer that success in identifying error-free performance occurred because discrimination of critical elements is not essential for determining that errors do not exist in a performance. Therefore, it might also be necessary, as a part of the learning treatments, to provide participants with examples of common errors (in addition to the correct model) prior to tests which require the detection of errors.

Another purpose was to examine the efficiency of several methods of

information presentation (video file and text). Results showed that significant differences existed between the text instructional group and the control group, the video plus text group and the control group, and the video plus text group and the video group. Although there was not a significant difference between the video plus text and the text group, Table 1 shows higher means scores for the video plus text group after all tests. Because the overhand throw is a multiple degree of freedom skill, it may require more treatment days than provided in this study to effect a statistically significant difference.

Two other aspects of the study that proved of interest were (a)changes in sophistication of language used in the description of the errors and, (b)the ability to recognize some of the more complicated components of the movement pattern. The control group showed no changes in either category. The video only group became more proficient in detecting some of the less complicated errors such as (a)inappropriate follow through, (b)stepping with the wrong foot and, (c)releasing the ball too late or too early. However, their use of the appropriate terminology such as (a)circular upward or circular downward backswing, (b)blocked versus differentiated rotation and, (c)homolateral versus contralateral step did not change. Both the text and video plus text groups improved noticeably in recognition of errors and the use of terminology with the video plus text group showing the most improvement, especially with the more complicated components such as early rotation, type of rotation and type of back swing. In summary, these results, in concert with the repeated measures Anova and paired-t results, tend to support the hypothesis that the video plus text treatment would be the most effective in helping participants become proficient in detecting errors in the overhand throw.

The failure of the video only group to show learning over time provides support for the suggestion (Rothstein & Arnold, 1976) that without an attention focusing mechanism videotape replay, or in this case a video file, is ineffective. In fact, the video group showed no change whatsoever over the period of this experiment. Video replay generally provides a great deal of information, much of it irrelevant to the performance of the task or identification of error, and without some type of attention focusing mechanism the learner has great difficulty discriminating between the relevant and irrelevant. As expected, the video plus text group (the text could serve as an attention focusing mechanism) did show learning over time which could be interpreted as support for Ball and Sekuler (1981), Johansson (1973)

and Kernodle & Carlton (1992) who suggested success in qualitative analysi is improved by the use of attention focusing devices. Based upon the result of this study, one might infer that text effectively describing the parts of th movement relevant to the performance of the task, may be require augmentation to the information provided by the video replay. Therefore, th results of this study and generalizations from research examining videotap replay infer the use of video files within a computer-based distance learnin paradigm should be augmented by utilizing some type of attention focusin mechanism.

Many elementary education teachers (without significant training i physical education) will be required to teach physical education and will nee some formal training in qualitative skill analysis to be successful in teachin motor skills. As previously mentioned (Biscan & Hoffman, 1974; Morrison & Reeve, 1988), qualitative skill analysis is not exclusively the domain of th physical educator and the ability to successfully analyze sports skills i dependent upon qualitative analysis training with that specific skil (Gangstead & Beveridge, 1984; Morrison & Harrison, 1985; Morrison & Reeve, 1986) . The results of this study suggest that preservice elementar education teachers now have a means of enhancing their qualitative analysis skills without sacrificing time needed for classroom interaction with thei students. In addition, the appropriate information presented in a distance learning format would allow practicing elementary education teachers to become more proficient in the qualitative analysis of skills they would like to include in their curriculum.

Appendix A

Preparatory phase

(a) the feet are parallel to the target with the body right-facing
(b) the body pivots to the right with the weight on the right foot
(c) the trunk rotates approximately 90 degrees to the right
(d) the throwing arm swings backward and upward and this motion is called a circular downward backswing

Execution phase

(a) take a long contralateral stride (not a homlateral stride), using the foot opposite of the throwing arm, in the intended direction of the throw
(b) the hips, spine and shoulders rotate in a sequence (differentiated rotation) in a counterclockwise movement.

(c) the arm and ball go down the back to just below the shoulder blades
(d) the arm uses a whipping action to move towards the point of ball release which is a point just forward of the head with the arm extended at the elbow

Follow through phase

(a) the body rotates to the left after release and the arm crosses the midline of the body
(b) the movement is continued until the momentum generated in the throwing action is dissipated

Appendix B

Test one errors

(a) the model is front facing
(b) the model is using a circular upward backswing
(c) the model is using a homolateral step (right foot)
(d) the release point is too early
(e) the model is not using a complete follow through

Test two errors

(a) the model starts with the right foot forward
(b) the model uses flexion/extension of the elbow
(c) the model has no weight shift
(d) the model has no hip rotation counterclockwise
(e) there is no follow through

Test three errors

(a) the model starts front facing
(b) the model strides with the homolateral foot (right foot)
(c) the arm stays straight with no flexion down the back
(d) the body rotates as a block from right to left
(e) the point of release is too late

Test four errors

(a) the model starts facing the target area
(b) the body does not rotate clockwise initially
(c) the contralateral (opposite foot) stride is too short
(d) the release point is too late
(e) the follow through is to the wrong side of the body (right side)

Test five errors

(a) the model starts with the left foot forward

(b) initial arm movement is flexion/extension
(c) there is no initial left to right body rotation
(d) the follow through stops short
(e) no final body rotation(right to left)

Test six errors

(a) there were no errors

Test seven errors

(a) the model does not take a step at any time
(b) the model uses a circular upward backswing
(c) the arm does not flex down the back
(d) the release point is too early
(e) the follow through is to the wrong side of the body

Test eight errors

(a) there were no errors

Test nine errors

(a) the arm did not flex and go down the back
(b) no initial rotation from left to right
(c) the ball release is too early
(d) the follow through is to the wrong side of the body
(e) the right foot steps across after the left foot steps

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