



Effect of Physical Educators' Appearance and Sex on Middle School Students' Learning Outcomes and Perceptions of Teacher Effectiveness

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Abstract: Physical Education (PE) teachers can have a great impact on the future physical activity levels of their students, and later, as adults. Professional appearance of teachers has been shown through previous research to have influence on student learning outcomes and perceptions of teacher effectiveness. This research aimed to build on prior studies to investigate the interaction between formal and informal appearance and gender of physical education teachers with middle school student learning outcomes and teacher perspectives. Four 20-minute videos were produced on the non-traditional invasion sport Tchoukball. The four videos consisted of female informal appearance, female formal appearance, male informal appearance, and male formal appearance. The videos were randomly shown to 433 middle school students located in southeastern United States followed by a post-video content examination and a teacher perception survey. Factorial ANOVAs were performed to identify any significant main effects or interactions on overall content exam, two content areas (skill technique and game strategy), and three teacher perspectives (likability, competence, and teacher as a role model). There was no significant main effect for teacher appearance and student learning outcomes. When considering sex of the teacher, there was a significant main effect for overall examination ($F(1, 428) = 9.45, p < .001, \eta^2 = .022, 1-\beta = .866$) and for strategies ($F(1, 428) = 17.22, p < .001, \eta^2 = .039, 1-\beta = .985$), while nothing was found for technique-related questions. On the three teacher perspectives, no significance was found between likability and competence, however there was a main effect on the survey questions about teachers as a role model when taking teacher appearance into consideration ($F(1, 424) = 5.01, p < .001, \eta^2 = .025, 1-\beta = .612$).

Keywords: Teacher appearance, Formal/informal, Tchoukball, Middle school physical education

1. Introduction

According to the Healthy People 2030 report, less than half (47.9%) of adults aged 18 years and over engaged in the recommended aerobic physical activity (PA) of at least moderate intensity for at least 150 minutes a week, or at least 75 minutes a week of vigorous intensity, or an equivalent combination in 2020 (Office of Disease Prevention and Health Promotion, 2023). Likewise, in 2019 only 23.2% of adolescents were physically active for at least 60 minutes daily. Previous Healthy People reports (2010) stated that physical education (PE) is the "primary source of PA and fitness instruction" for adolescents (National Center for Health Statistics, 2012). Maximizing skill acquisition of students, along with the necessary knowledge and attitudes to be physically

active across the lifespan, is the goal for a quality PE curriculum and vital for physical educators to reach all students. Physical education teacher education (PETE) programs must prepare PE teacher candidates to meet these student needs so that they can combat the growing epidemic of overweight and obese children and adults in the United States.

Like all teacher preparation programs, PETE programs have a set of standards and expectations for their pre-service teacher candidates. In PE, those standards come from SHAPE America, which is the governing body for health and physical educators across America and are designed to develop teacher candidates into competent and capable future professionals. SHAPE America (2017) cites the

following as initial PETE standards: (1) *demonstrate content and foundational knowledge*, (2) *skillfulness and health-related fitness*, (3) *planning and implementation*, (4) *instructional delivery and management*, (5) *assessment of student learning*, and (6) *professional responsibility*. These guiding principles and standards are embedded throughout the physical education curriculum and help PE teacher candidates meet industry-specific expectations upon graduation.

The goal for beginning PE teachers is to demonstrate effective pedagogical skills right away within the classroom to get students physically active, however it may take some time for even the most skilled and prepared PE teachers to deliver lessons that reach all students. Effective teaching and its components are improved and perfected over time through reflection, assessment, and improved strategies within the classroom. Conversely, it may take only seconds for a student to form an idea of their teachers' effectiveness based on their appearance, and that bias could have an impact on student learning in PE and attitudes toward a physically active lifestyle (Bradford and Hickson, 2010; Mitchell, 2007).

In looking at prior research in PE teacher appearance and student perceptions, three main areas surface as a focal point: body fatness, functionality and body mobility, and age. First, Melville and Maddalozzo (1988) examined a physical educator's body fatness and its relationship to high school students' knowledge on exercise concepts, their attitudes toward the teacher, and the likelihood to develop exercise habits because of the teacher's physical appearance. The study used a male teacher to capture two 20-minute videos where exercise concepts were presented. One video was presented with the teacher in his normal clothes and fit appearance. The other video was altered with an augmented appearance by adding padding underneath the clothing to give an overweight and unfit appearance. Both video lessons were identical in content and delivery. The videos were shown randomly to 850 students who, after watching the video, were given a 13-question content examination (six on flexibility and seven on weight control) and a five-question Likert scale survey with questions on likability, expertise, teacher as a role model, teacher practiced what he preached, and if the student plans to improve their fitness levels. The results of the study showed that the appearance of a male physical educator's body fatness did influence high school students' learning on exercise

concepts. Students who viewed the overweight teacher video had approximately two more incorrect answers on the examination (mean number of errors = 3.70) than those who viewed the fit appearing video (mean number of errors = 1.94). The researchers also found significant effects on questions one (likability), two (expert on fitness), four (teacher practiced what he preached), and five (students plan to improve fitness). These findings suggest that students seemed to prefer the fit appearing teacher and thought he was more knowledgeable on fitness concepts, and that they were more perceptive of body dimensions which increased their plans to improve their own fitness levels in the future.

Following Melville and Maddalozzo (1988), Thompson (1996) performed a similar study, but only examined its effect on student test scores. The study had 132 sixth and seventh graders view one of two 20-minute videos of a male teacher lecturing on general exercise and diet guidelines. The first video was him teaching with his normal and fit appearance. The second video portrayed the same teacher with a "fat suit" similar to what Melville and Maddalozzo (1988) used in their study. Both videos had the same content and delivery methods. Students were randomly shown one of the two videos and then given a 15-item test on general fitness principles afterwards. Findings were aligned with what Melville and Maddalozzo (1988) found, indicating that students who watched the fit appearing video performed better on the test on general exercise principles and dietary guidelines.

Dean *et al.* (2005) also performed a similar study to determine if body fatness affected cognitive performance and attitudes toward the teacher in middle school students. Different from Melville and Maddalozzo (1988) and Thompson (1996), this study used a female teacher to deliver two six-week PE classes that meet three times a week for 60 minutes each. The researchers had the female teacher deliver content in one class as her normal healthy and fit-appearing self. The other class received the same instruction with the same teacher wearing a "fat suit" that presented an overweight appearance. Following the six-week instruction, a total of 93 seventh, eighth, and ninth grade students were given a 35-item content examination and an eight-item student attitude questionnaire. Results demonstrated a consistent finding with Melville and Maddalozzo (1988) and Thompson (1996) that students who were in the fit appearing class scored better on the examination over the health-related fitness content. Contrary to Melville and Maddalozzo (1988) and Thompson (1996),

this study found no significant difference in student attitudes toward the teacher between the two classes. Delivery methods between the six-week in-person classes (Dean *et al.*, 2005) and the 20-minute videos (Melville & Maddalozzo, 1988; Thompson, 1996) could account for the variances.

Finally, Conlin (2010) conducted a study on a group of seventh, eighth, and ninth grade students' test scores on aerobic fitness concepts and their perceptions of the teachers after viewing a video. The study used both male and female teachers with and without the "fat suit" to create four 10-minute videos, featuring an average-appearing female teacher, average-appearing male teacher, overweight-appearing female teacher, and an overweight-appearing male teacher. Both male ($n = 834$) and female ($n = 784$) students from eight middle schools were randomly shown one of the four videos followed by a 15-question examination and a 7-item questionnaire about their attitudes toward the teacher and physical activity. For all students, analysis revealed a main effect for teacher appearance ($p < .001$) for attitudes toward the teacher. Main effects were also found for teacher sex for female students ($p = .008$) and male students ($p = .036$) and appearance + sex interaction effect for female students ($p = .002$) and male students ($p = .012$). There was no significant main effect for female students for teacher appearance, teacher sex or interactive effects on test score improvement. Male students also had no significant main effect for teacher appearance or interactive effects, however there was significant main effect for teacher sex ($p = .002$). Male students performed better with male teachers, however female students score had no significant differences. In considering the questions on attitudes toward the teachers, results showed main effects for female students in teacher appearance ($p = .008$) and teacher sex ($p = .034$, $p = .003$, $p = .004$) and appearance + sex interaction effect ($p = .005$ and $p = .035$). For male students there was a main effect for teacher sex ($p = .001$) and appearance + sex interaction effect ($p = .003$, $p = .002$, $p = .008$). Collectively, findings of these studies indicated that middle and high school students demonstrated higher test scores on exercise concepts and health-related fitness knowledge when receiving lessons from fit-appearing PE teachers than overweight-appearing teachers (Conlin, 2010; Dean *et al.*, 2005; Melville & Maddalozzo, 1988, Thomson, 1996) and they favored fit-appearing teachers than overweight-appearing teachers (Conlin, 2010, Melville & Maddalozzo, 1988).

Following Melville and Maddalozzo's (1988) research design, Bryant and Curtner-Smith (2008, 2009a, 2009b) carried out a three-part study examining the functionality and body mobility of a female PE teacher on student learning and their perceptions of the teacher. Specifically, they made two 20-minute videos; one featuring an able-bodied teacher (ABL) teaching swimming on deck to 10 students in the pool, and the second video featuring the same teacher delivering the same content to the same group of students from a wheelchair (WCL). One of the two videos was randomly shown to elementary, middle, and high school students. After watching the video, students were given a 12-question content examination (six questions on technique and six on strategy). A 6-item teacher perception questionnaire (two items on likability, two items on mastery of content, and two items on appropriateness of being a role model) was also given to the students. Bryant and Curtner-Smith (2008) found that elementary school students who watched the WCL video scored better on the technique portion of the examination. There was no significance found in perceptions of the teacher based on the ABL or the WCL video that the elementary school students watched. In the middle school paper, Bryant and Curtner-Smith (2009a) found no significant difference in content examination or perceptions of the teacher between the two videos. At the high school level, statistical analyses showed that students who viewed the ABL video scored significantly higher on the technique questions than those who watched the WCL video, but no significant difference was found on the perception scores (Bryant & Curtner-Smith, 2009b). In sum, elementary school students who watched the WCL video performed better on the technique-related questions than their peers who watched the ABL video, but high school students who watched the ABL video yielded better scores than those who watched the WCL video. Besides, teacher's (dis)ability had no significant effect on students' perceptions of the teacher at any of the grade level clusters.

Most recently, Pennington *et al.* (2019, 2020a, 2020b) conducted three studies on the aging perspective of physical appearance. Adopting the same research protocols, one young-appearing lesson (YAL) was delivered by a male PE teacher as his true 28-year-old self and another middle-aged appearing lesson (MAL) was delivered by the same teacher with hair/facial makeover by a professional makeup artist to drastically make him appear older. Both lesson videos were 20 minutes in length with the same swimming

content, environment, and students. The same 12-question content examination and six-item teacher perception questionnaire were used to collect data from elementary, middle, and high school students. Collectively, elementary and middle school students who watched the YAL video scored significantly higher on the content examination than their peers who watched the MAL video (Pennington *et al.*, 2019, 2020a); however, no significant result was found on student learning at the high school level (Pennington *et al.*, 2020b). In terms of students' perceptions of the teacher, elementary school students thought the young-appearing teacher was more likeable, more competent, and a better role model than the middle-aged appearing teacher (Pennington *et al.*, 2019). At the middle school level, students who viewed the YAL video perceived the teacher more favorably in the areas of likeability and appropriateness as a role model, but not in competence, than those who viewed the MAL video (Pennington *et al.*, 2020a). Interestingly, high school students perceived the middle-aged appearing teacher to be more of a role model than the young-appearing version of the teacher (Pennington *et al.*, 2020b).

According to prior research, appearance (body fatness) plays a role in the formation of student perceptions about their teachers (Bradford and Hickson, 2010; Conlin, 2010; Dean *et al.*, 2005; Melville & Maddalozzo, 1988; Thomson, 1996). As stated earlier, physical educators stand to be one of the most influential people to deliver physical fitness and health concepts to school age children and adolescents, and their physical appearance influences the acquisition of the necessary skills, knowledge, and attitudes to be physically active during their lifetime. Most of the previous studies only examined teacher appearance as the variable, and only one included both teacher appearance and sex. This study has the potential to enrich the existing literature, and further explore the role of teacher appearance on learning and attitudes. The purpose of this study was to examine the influence of PE teachers' formal or informal appearance on middle school students' content knowledge and teacher perceptions.

2. Methods

2.1 Participants

Students from eight different middle schools located in a southeastern state of the United States participated in the study. Two hundred and thirty-nine sixth graders (55.2%), 58 seventh graders (13.4%), and 136 eighth graders (31.4%) for a total of 433

participants' data were collected. Participant sex composition consisted of 225 male (52.0%) and 205 female (47.3%) with three missing data (0.7%). Table 1 illustrates participant frequencies by school, grade, and sex. The attire that the regular PE teachers wore from each school site consisted of athletic-type pants or shorts, either polo style shirt or sweatshirt/pullover top, and regular groomed hairstyles with some females wearing ponytails. Parental consent and assent forms were obtained from all participants to fulfill the requirements for the institutional review board for human subjects.

2.2 Lesson Videos

Tchoukball was the sport chosen for this study because it is non-traditional in nature, yet it requires basic skills such as running and overhand passing to begin and allows learners to progress to more advanced skills, such as throwing and catching at different angles. Tchoukball is in the category of invasion games, which most students in this region of the country can relate to other more traditional sports, such as basketball or soccer, with similar skills. All invasion sports have transferrable skills, such as throwing/receiving an object, change of direction, traveling in multiple directions, speed and agility, spatial awareness, and anticipation. Many invasion sports share common offensive and defensive tactics or strategies as well, such as maintaining possession, creating space for self or teammates, attacking a goal, defending a goal or space, defensive positioning, and predicting an opponent's movement (Butler *et al.*, 2008). Therefore, the sport was novel and new to most students, but concepts and skills were relatable through prior experience in other invasion game/sports traditionally taught in middle school physical education curriculums. A tchoukball lesson was designed by the authors and included the following necessary lesson components: (a) introduction/rules, (b) skill learning/practice, (c) game play and (d) closure. The first author has 15 years of experience teaching physical education and athletic administration in K-12 schools, 20 years of coaching a variety of sports from youth to high school varsity, and 13 years working in higher education PETE programs preparing future teachers and coaches. The second author has 14 years of teaching experience in PETE programs at the college level. Both authors reviewed the lesson plan and format, discussed content and delivery methods, and planned each lesson segment with specific time allotment.

Table 1. Participant sex and grade compositions by schools.

	School A	School B	School C	School D	School E	School F	School G	School H	Total
Sex									
Female	23 (39.0%)	38 (38.8%)	34 (48.6%)	13 (54.2%)	31 (62.0%)	20 (48.8%)	34 (54.0%)	12 (42.9%)	205 (47.3%)
Male	36 (61.0%)	60 (61.2%)	36 (51.4%)	11(45.8%)	19 (38.0%)	21 (51.2%)	29 (46.0%)	13 (46.4%)	225 (52.0%)
Missing	0	0	0	0	0	0	0	3 (10.7%)	3 (0.7%)
Grade									
Sixth	0	0	70 (100%)	24 (100%)	50 (100%)	31 (75.6%)	36 (57.1%)	28 (100%)	239 (55.2%)
Seventh	34 (57.6%)	0	0	0	0	0	24 (38.1%)	0	58 (13.4%)
Eighth	25 (42.4%)	98 (100%)	0	0	0	10 (24.4%)	3 (4.8%)	0	136 (31.4%)
Missing	0	0	0	0	0	0	0	3 (10.7%)	
Total	59 (13.6%)	98 (22.6%)	70 (16.2%)	24 (5.5%)	50 (11.5%)	41 (9.5%)	63 (14.5%)	28 (6.5%)	433 (100%)

Two PETE undergraduate students (one male and one female) were invited to deliver the lessons. They were chosen for their excellent preparation and performance within the teacher education program. As an incentive, each was given athletic/PE apparel valued at \$200 for their participation in the study. Both authors and the two undergraduates met on two separate occasions to discuss the lesson content/format, and to practice the delivery of each lesson segment. Rehearsal of the lesson was done until all parties were comfortable with the format, and content and activities could be delivered within the timeframe of the local PE classes.

The lessons were delivered and recorded in two seventh grade classes at a local private school. There were 15 students (seven female and eight male) in Class A and 14 students (six female and eight male) in Class B. Both classes meet two times per week for 50 minutes each. They meet in a typical gymnasium with a high school sized-regulation basketball court as their main activity space with retractable bleachers on one side. All equipment and teaching materials for the lessons were brought on-site from the university, and each PETE undergraduate taught the same lesson twice to both classes.

The first lesson was taught by the female undergraduate with an informal appearance (FIA; hair down, an oversize hoodie covering most of her short shorts, and long socks with slides; see Figure 1a) and delivered to Class A. The second lesson was delivered to Class B on the next day and taught by the same female undergraduate with a formal appearance (FFA; hair up in a bun, a tucked-in short sleeved collared shirt, athletic joggers, and athletic shoes; see Figure 1b). A third lesson was taught by the male undergraduate with an informal appearance (MIA; a backward hat, an unshaven face, a short-sleeved T-shirt over knee-length shorts, and long socks with slides; see Figure 1c) and delivered to Class A. The final lesson was taught to Class B on the next day by the same male undergraduate student with a formal appearance (MFA; a crew cut hairstyle, clean shaven, a short-sleeved collared shirt over full-length khaki pants, and athletic shoes; see Figure 1d). Audio and video were captured in the same corner/angle of the gym using an iPad with audio receiver plugged in, while undergraduate teachers wore a wireless microphone to ensure proper audio on the videos.

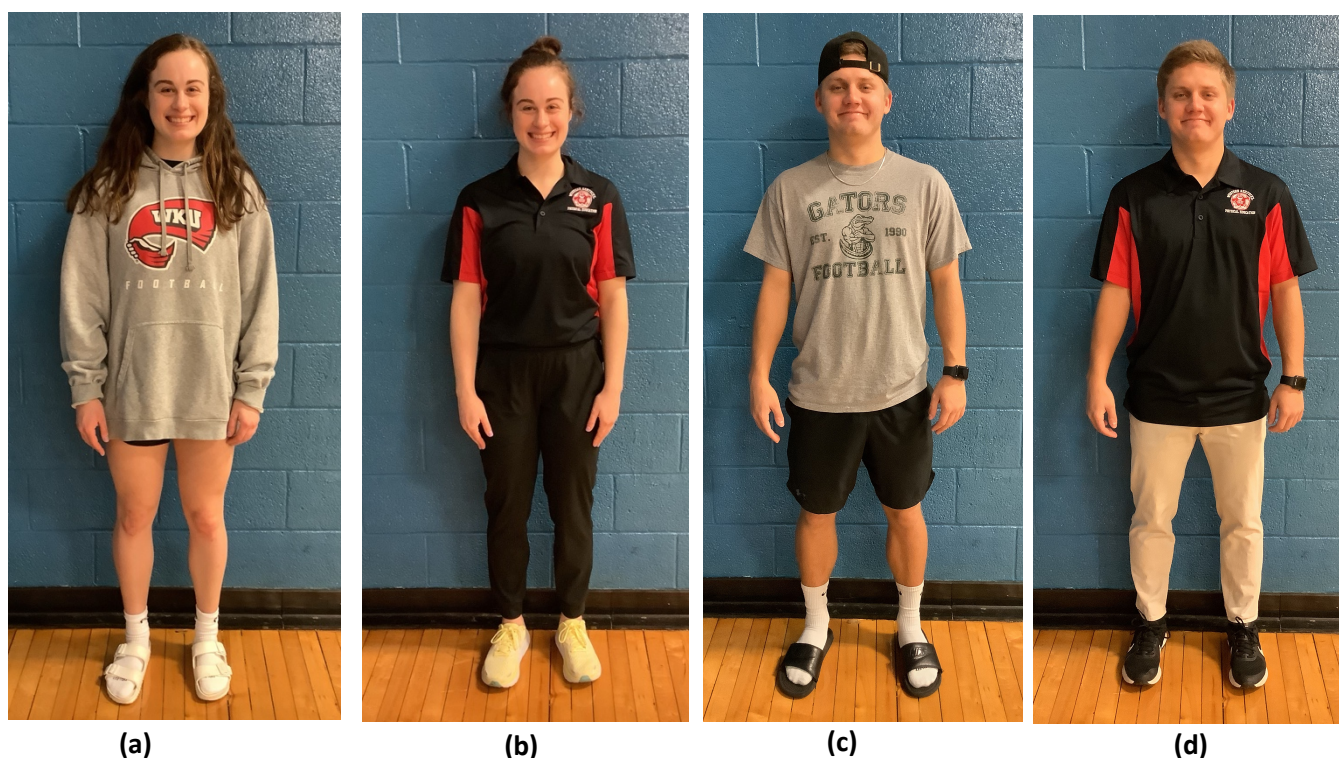


Figure 1(a) Female Informal Appearance (FIA) **(b)** Female Formal Appearance (FFA) **(c)** Male Informal Appearance (MIA) **(d)** Male Formal Appearance (MFA)

2.3 Lesson Similarity and Quality

To keep the lessons similar in length, content, and necessary components, all four video lessons were edited down to 20 minutes from their original footage, excluding the additional time spent in organization, skill practice, and game play. Due to the novelty of the sport and quick transitions of the lesson activities, the authors believed that keeping the lesson to 20 minutes would hold the students' focus and attention. Three systematic observation tools were used to ensure that the all videos were similar in components and quality (Bryant and Curtner-Smith, 2008, 2009a, 2009b; Pennington *et al.*, 2019, 2020a, 2020b). First, the Physical Education Teacher Assessment Instrument was used to code the time spent in the five instructional tasks (i.e., planned presentation, response presentation, monitoring, performance feedback, and motivational feedback) and five managerial tasks (i.e., beginning/ending class, equipment management, organization, behavior management, and other tasks) (Phillips *et al.*, 2000). Table 2 demonstrates that the four videos were very similar in lesson component and quality. Over half of the total time was spent on instruction and reinforcement of key points, while at least one-third of the 20 minutes were spent on skill practice and game play. Management and organizational tasks were kept to a minimum, such as the time spent on

beginning/ending class. On the last two days of lesson delivery, the students were instructed to do their best in acting like it was their first time receiving the lesson. In reality, it was their second time but with different teachers. It was reasonable for some students to act differently because they had developed an understanding of the motor skills and tactics/strategies needed to successfully participate in Tchoukball. To keep the videos consistent, the teachers were reminded to give similar quantity and quality of feedback to their students. Data showed that the amount of feedback given in videos three and four was lower, but it was understandable considering the acquisition of skills and concepts from lessons one and two was obtained.

Curtner-Smith's (2001) Instrument for Identifying Teaching Styles was used to verify which teaching style the teachers were employing (i.e., command, practice, reciprocal, self-check, inclusion, guided discovery, divergent, and going beyond), or if they were managing the class. Table 2 demonstrates that both teachers employed the practice style in all four videos and spent very similar time within management.

The third method was task analysis, which was used to summarize the duration of each lesson component (Table 2). The lesson components were

predetermined by the authors to allow for the learning of necessary tchoukball skills, strategic and tactical concepts, and participation in small/large team game play. The lesson components consisted of instruction/rules, catching/throwing while stationary, catching/throwing while moving, shooting/defending straight at target, shooting/defending at all angles, small-sided games, full court games, and closure. Most segments recorded similar timing, such as catching and throwing while moving segment, as well as the shooting/defending and game play. There were, however, minimal inconsistencies in timing between catching/throwing skill practice session while stationary. This could have been due to the teachers varying the time spent on the practice session of the throwing/catching skill segment.

2.4 Data Collection

Like Bryant and Curtner-Smith (2008, 2009a, 2009b) and Pennington et al.'s (2019, 2020a, 2020b) research, a 12-question tchoukball content examination (Appendix A) was utilized to measure student learning. Both authors created and edited each question to ensure that the test accurately represented what was shown in the videos. There were six technique-related questions and six strategy-related multiple-choice questions on the content examination. To ensure that the exam content and questions were appropriate for middle school students, two widely used instruments, the Flesch-Kincaid Reading Ease test (Flesch, 1975) and the Flesch-Kincaid Grade Level test (Kincaid et al., 1975), were implemented. The first author uploaded the text of the content exam to the online program which uses the Flesch-Kincaid formulas to examine sentence length, word length, and number of syllables and calculate a reading ease score (zero to 100). According to Flesch-Kincaid (Kincaid et al., 1982), a score of 80 or above is determined to be in the easy-to-read category. The Flesch-Kincaid Grade Level is equivalent to the grade reading level required by the U.S. Department of Education. Results showed that the examination had a reading ease score of 92.2 and a reading level of 3.0 (grade level 3), which was appropriate for middle school students.

In addition to the content examination, a six-item perception questionnaire (Appendix B) was also given to assess students' perceptions of teacher effectiveness. Modified from previous research (Bryant & Curtner-Smith, 2008, 2009a, 2009b; Pennington et al., 2019, 2020a, 2020b), this questionnaire utilized two questions each from three different categories:

liability, competence, and appropriateness as a role model. A five-point Likert scale using a happy face associated with "strongly agree" and an angry face associated with "strongly disagree" was employed.

The same method was also used for the perception questionnaire to identify the readability and grade level appropriateness. Results yielded a lower reading ease score of 76.9 and higher grade level score of 4.8 (Kincaid et al., 1975) than the examination. Despite the differences, the scores were still acceptable for middle school students.

Each PE class at eight middle schools was randomly assigned to watch one of the four videos created. Prior to viewing the video, students were informed that there would be a post-video examination and survey distributed to complete. Directly after viewing the video, students were given a pencil and the one-page exam and perception questionnaire (front and back) to complete. They were instructed to read all questions and answer options thoroughly before circling what they believe to be the correct choice for each of the 12 questions. They also asked to rate the degree to which they liked the teacher in the video, believed they are competent, and thought they were a positive role model by checking the appropriate box that corresponded with the Likert scale from "strongly agree" to "strongly disagree".

It should be noted that the regular PE teachers at each site were consistent in the formal or informal attire that they wore daily. They wore normal comfortable and free-moving clothing with appropriate footwear for participation in physical movement. Students were not accustomed to one or the other, and therefore forming a bias between the formal/informal appearance of our undergraduate students is a non-factor.

2.5 Data Analysis

Following the grading of all exams for grades six through eight, the total number of correct answers for both technique and strategy questions (ranging from zero to six) and the number of total correct for the entire exam (ranging from zero to 12) were calculated for analysis. For the teacher perception questionnaire, the total score of teacher likability, competence, and role model (ranging from two to 10 for each) was also captured. Separate two (teacher appearance) x two (teacher sex) ANOVAs were used to identify significant main effects or interaction effects on the overall exam, the two content areas, and the three teacher perceptions.

Table 2. Percentages of time spent in instruction, management, skill learning, and game play for the four videos

Instrument	FIA	FFA	MIA	MFA
Physical Education Teacher Assessment Instrument				
Planned presentation	43.67	41.42	41.92	41.83
Response presentation	17.00	15.00	17.08	16.25
Monitoring	34.29	38.52	37.76	38.02
Performance feedback*	1.56 (14)	1.13 (12)	0.89 (8)	1.12 (11)
Motivational feedback*	1.23 (15)	1.27 (13)	0.68 (6)	0.61 (7)
<i>Total instruction</i>	<i>97.75</i>	<i>97.34</i>	<i>98.33</i>	<i>97.83</i>
Beginning/ending class	0.58	0.58	0.25	0.67
Equipment management	0	0	0	0
Organization	1.67	2.08	1.42	1.50
Behavior management	0	0	0	0
<i>Total management</i>	<i>2.25</i>	<i>2.66</i>	<i>1.67</i>	<i>2.17</i>
Instrument for Identifying Teaching Styles				
Reproductive styles				
Command style	0.00	0.00	0.00	0.00
Practice style	97.33	97.17	98.08	97.67
Reciprocal style	0.00	0.00	0.00	0.00
Self-check style	0.00	0.00	0.00	0.00
Inclusion style	0.00	0.00	0.00	0.00
Productive styles				
Guided discovery	0.00	0.00	0.00	0.00
Divergent	0.00	0.00	0.00	0.00
Going beyond	0.00	0.00	0.00	0.00
Management	2.67	2.83	1.92	2.33
Task Analysis				
Instruction/Rules	17.35	16.75	17.45	21.50
Catching/Throwing (Stationary)	7.75	8.30	2.45	2.93
Catching/Throwing (while moving)	8.27	7.90	10.75	7.75
Shooting/Defending (Straight)	16.75	17.45	20.10	16.45
Shooting/Defending (Angles)	16.96	16.20	15.54	17.45
Small-Sided Games	15.37	14.50	20.75	18.75
Full Court Games	14.79	16.25	10.05	12.35
Closure	2.76	2.65	2.91	2.82

Note. FIA = female informal appearance, FFA = female formal appearance, MIA = male informal appearance, MFA = male formal appearance; *Frequencies of performance and motivational feedback are included in parentheses.

3. Results and Discussion

Among the 433 total participants, 99 students were assigned to watch the FIA video, 105 watched the FFA video, 125 watched the MIA video, and 104 watched the MFA video. Individual grade and sex frequencies and percentages by videos are illustrated in Table 3.

3.1 Learning Outcomes

When looking at the post-video examination results (Table 4), the participants scored mediocre with an average score of 6.54 ($SD = 2.05$) over the entire content examination, with an average score of 3.51 ($SD = 1.28$) on technique questions and an average score of 3.03 ($SD = 1.31$) on questions related to strategies. There was no significant main effect for teacher appearance on the overall examination or the two content areas. Our finding is congruent with what Bryant and Curtner-Smith

(2009a) found in their research on teacher's (dis)ability among middle school students and what Pennington et al., (2020b) found in their study on teacher's age among high school students. When considering teacher sex, significant main effects were on the overall examination ($F(1, 428) = 9.45, p < .05, \eta^2 = .022, 1-\beta = .866$) and strategy-related questions ($F(1, 428) = 17.22, p < .001, \eta^2 = .039, 1-\beta = .985$), but not for technique-related questions. Specifically, students who viewed the female videos performed better on the overall examination ($m = 6.86, SD = 1.95$) and strategy-related questions ($m = 3.31, SD = 1.25$) than those who viewed the male videos ($m = 6.26, SD = 2.09; m = 2.79, SD = 1.32$). Our findings were in line with Conlin's (2010) where teacher sex had a significant effect on student learning. It is worth noting that in Conlin's (2010) dissertation, she analyzed data by student sex, and the only significant main effect for teacher sex was found among the male students. Specifically, the male students who watched the male videos had significant improvement on the test. Lastly, there was no significant interaction effect for teacher appearance and sex on the overall or content area scores. This is congruent with Conlin's (2010) findings that, student learning was not affected when taking teacher appearance and sex into account.

3.2 Perception of Teacher Effectiveness

As a group, the middle school participants liked the undergraduate teachers in the videos ($m = 7.76, SD = 1.79$), believed they were competent ($m = 7.97, SD = 1.71$); however, they were a little more reserved about perceiving them as role models ($m = 6.48, SD = 2.39$). No significant main effect was found for teacher appearance on the likability and competence scores; however, there was a significant main effect on their appropriateness as a role model ($F(1, 424) = 5.06, p < .05, \eta^2 = .012, 1-\beta = .612$). The participants who watched the informal appearance videos thought the teachers were better role models ($m = 6.73, SD = 2.46$) than those who watched the formal appearance videos ($m = 6.21, SD = 2.28$).

This finding is aligned with Conlin (2010), Melville and Maddalozzo (1988), and Pennington et al., (2019, 2020a, 2020b) that teacher appearance could significantly influence students' perceptions of the teachers. Furthermore, there was no significant main effect for teacher sex on the three perception scores, which was contrary to what Conlin (2010) found. In her research, the students liked the female teacher significantly better than the male teacher, and the

male students thought the male teacher was more of an expert on fitness concepts than the female teacher. In this study, the participants did like the female teacher better ($m = 7.81, SD = 1.68$) than the male teacher ($m = 7.70, SD = 1.88$), and thought the male teacher was more competent in teaching Tchoukball ($m = 8.03, SD = 1.70$) than the female teacher ($m = 7.91, SD = 1.71$); however, the differences were not at the statistically significant level. Lastly, there was no significant interaction effect for teacher appearance and sex on any of the perception scores, which was also contradicting to what Conlin (2010) found. Combining our findings with what was found in previous research, results were inconclusive. Fellow scholars are encouraged to carry out more studies in this line of research to create a trend for a plausible explanation on how teacher appearance, teacher sex, and teacher appearance and sex could affect student learning and their perceptions of teachers.

This area of study would benefit from future research by considering expanding the study to include additional teacher models with varying levels of formal versus informal presentation. While variables were controlled as much as possible to ensure continuity of the lessons between the two undergraduates teaching their two lessons, the nature of both the length of the lesson and the low number of teachers contributes to the limitations, as well as the conclusions that can be made from these results. Because of this, future research in this area should include more teachers to ensure that the students are not making their judgements based upon the personality traits of just two teaching models. Another limitation of the study was that the students who watched the videos were a very diverse population while the race of the two teachers were Caucasian. Future research should have enough diversity within the teacher videos to match population diversity in the students watching. Finally, to control for more variables in teaching style future research should consider cutting the lessons down to a time limit that allows all the teachers to use a scripted lesson to ensure students are receiving the same exact content. Since there is growing research that supports the idea of "first impressions" or student bias based on teacher appearance, this will ensure more confidence in the results of the effects and interactions.

Table 3. Participant sex and grade compositions by videos.

	FIA	FFA	MIA	MFA	Total
Sex					
Female	50 (50.5%)	57 (54.3%)	44 (35.2%)	54 (51.9%)	205 (47.3%)
Male	46 (46.5%)	48 (45.7%)	81 (64.8%)	50 (48.1%)	225 (52.0%)
Missing	3 (3.0%)	0	0	0	3 (0.7%)
Grade					
Sixth	45 (45.5%)	52 (49.5%)	51 (40.8%)	91 (87.5%)	239 (55.2%)
Seventh	43 (43.4%)	0	15 (12.0%)	0	58 (13.4%)
Eighth	11 (11.1%)	53 (50.5%)	59 (47.2%)	13 (15.5%)	136 (31.4%)
Total	99 (22.9%)	105 (24.2%)	125 (28.9%)	104 (24.0%)	433 (100%)

Note. FIA = female informal appearance, FFA = female formal appearance, MIA = male informal appearance, MFA= male formal appearance.

Table 4. Means and standard deviations of content examination and perceptions of teachers.

	FIA		FFA		MIA		MFA		TOTAL	
	(n = 98)		(n = 105)		(n = 125)		(n = 104)		(n = 432)	
	Mean	SD	Mean	SD	Mean	SD	Mean	SD	Mean	SD
Total score	6.79	2.01	6.92	1.92	6.32	2.16	6.18	2.02	6.54	2.05
Technique score	3.53	1.37	3.56	1.11	3.58	1.40	3.34	1.22	3.51	1.28
Strategy score	3.26	1.20	3.36	1.30	2.74	1.32	2.85	1.33	3.03	1.31
Likability	7.88	1.82	7.75	1.56	7.88	1.67	7.50	2.10	7.76	1.79
Competence	7.68	1.90	8.12	1.50	8.05	1.53	8.01	1.89	7.97	1.71
Role model	6.75	2.61	6.54	2.24	6.71	2.34	5.88	2.29	6.48	2.39

Note. FIA = female informal appearance, FFA = female formal appearance, MIA = male informal appearance, MFA = male formal appearance; SD = standard deviations; total score ranged from zero to 12; technique and strategy scores ranged from zero to six; likability, competence and role model ranged from two to 10.

Pre-service teacher candidates in PETE programs can benefit from understanding how their professional appearance, along with their preparation in all standards, influences student learning outcomes and perceptions of teacher effectiveness. Since students learn life-long PA habits in PE class, this knowledge can be useful to adolescents, and eventually adults, in potentially meeting and exceeding the daily recommended amounts of moderate to vigorous PA.

4. Conclusions

The data from this study, while not significant, suggest that students perform better on content examinations when learning from a female formal-appearing teacher. This study demonstrated that students also performed better when learning from a male informal-appearing teacher on game strategies versus technique. This study is consistent with previous findings in that physical appearance, whether correlated to body composition, physical functioning and mobility, or formal appearance by the teacher, can influence student learning outcomes. Regarding the perceptions of teacher effectiveness, appearance does not have a strong enough influence in determining likability and competence of the teacher, but it does influence student perceptions toward believing their teacher is a good role model. When considering teacher appearance and teacher sex, this study found that there was no interaction to any of the perceptions scores of likability, competence, or role model.

As mentioned earlier, physical educators are the primary source of fitness and PA instruction for K-12 students to learn and obtain the skills, knowledge, and attitudes towards being physically active across their lifespan. As PETE programs continue to prepare the next generation of PE professionals it is important to consider the following take-aways from this study:

- 1) The physical appearance of PE teachers can and does influence student learning. While results were not significant, it does suggest that students give some consideration to the formal or informal appearance of their teachers.
- 2) The physical appearance of PE teachers can and does influence student perceptions, specifically when considering their teachers as a potential role model.

Formal and Informal appearance of both male and female PE teachers can and does have varying effects on student learning and perceptions.

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Author Contributions

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Data availability

The datasets generated and analyzed during the current study are available from the corresponding author upon approval of the request.

Does this article pass screening for similarity?

Yes

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APPENDIX A

Tchoukball Summative Assessment (Middle School)

APPENDIX A






Student name: _____

Grade: _____

Student: Male or Female (circle one)

1. When taking a jump shot, you should take off on:
 - a. The same foot
 - b. The opposite foot
 - c. Either foot
 - d. Both feet
2. When catching a pass ABOVE the waist, you should:
 - a. Use one hand to catch the ball
 - b. Trap the ball against your chest
 - c. Keep palms up and pinkies together
 - d. Form a triangle with thumbs and pointer fingers
3. To help you in catching a rebound, you should move:
 - a. Your feet
 - b. Your arms
 - c. Your whole body
 - d. a & b
4. The best way for a team to play defense in Tchoukball is to:
 - a. Zone coverage
 - b. Defend the best player
 - c. Cover each player as close as possible
 - d. Spread out around the playing area
5. When catching a ball that is BELOW the waist, you should:
 - a. Use one hand to catch the ball
 - b. Trap the ball against your chest
 - c. Keep palms up and pinkies together
 - d. Form a triangle with thumbs and pointer fingers
6. When the OTHER team shoots the ball at the rebounder, you should:
 - a. Knock it out of the way
 - b. Try to catch the rebound
 - c. Run to the other side for transition
 - d. Stay where you are for transition
7. When no defender is on your side of the rebounder, you can score a point by:
 - a. Taking the shot yourself
 - b. Passing to the other end of the court
 - c. Passing to your teammate on the opposite side
 - d. Taking 3 steps to the other side of the rebounder
8. You can get a hard down-angle on the rebound if you take a:
 - a. Side-arm shot
 - b. Back-hand shot
 - c. Set shot
 - d. Jump shot
9. The best way to get the ball to the other end of the court is to:
 - a. Use many short passes
 - b. Use 3 big steps to get there
 - c. Use both passes and steps
 - d. Use one long passes
10. When the defenders are not close to the rebounder, you can score a point by throwing a:
 - a. Hard-high shot that rebounds flat toward mid-court
 - b. Soft-low shot that lands just outside the forbidden zone
 - c. Medium-hard shot that rebounds flat toward mid-court
 - d. Medium-hard shot that rebounds to the side of the court
11. When you try to catch a ball that is close to the ground, you should:
 - a. Dive head-first and land on your stomach
 - b. Drop to your knees and arms under the ball
 - c. Run to the ball and kick it up
 - d. Slide and land on the side of your body
12. To create an open lane for a pass or a shot at the rebounder, you should:
 - a. Bounce or roll the ball
 - b. Make a long-hard pass
 - c. Make many short passes
 - d. Use your 3 steps

APPENDIX B: PERCEPTION QUESTIONNAIRE

Your Sex: Male Female					
Your Grade: 4 th 5 th 6 th 7 th 8 th 9 th 10 th 11 th 12 th					
After viewing today's video, please check the most appropriate response.					
1. I like the PE teacher who taught tchoukball in the video.					
2. I liked how the PE teacher in the video taught tchoukball.					
3. The PE teacher in the video knows a lot about tchoukball.					
4. The PE teacher in the video is a tchoukball expert.					
5. The PE teacher in the video makes me feel like playing tchoukball.					
6. The PE teacher in the video makes me want to improve my tchoukball skills.					