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Gender and Grade Level Differences in Teaching and Assessing Health-related Fitness Topics Among US Physical Educators

Author Information
Stacy Imagbe[1], Ben D. Kern[2], James Clemons[3]
[1]School of Kinesiology, Louisiana State University, Baton Rouge, USA
[2]Division of Kinesiology and Health, University of Wyoming, Laramie, USA
[3]School of Kinesiology, University of Louisiana at Lafayette, Lafayette, USA

Corresponding Author:
Ms. Stacy Imagbe
Email: simagb1@lsu.edu

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ABSTRACT

Purpose: To examine gender and grade-level differences in teaching and assessment of health-related fitness (HRF) among US physical educators. **Methods:** A survey measuring teaching (tHRF) and assessing (aHRF) HRF subtopics was completed by 796 US physical educators. Dependent paired samples t-tests were performed per individual HRF items within each grade-level cluster (K-2, 3-5, 6-8, 9-12). Pearson's *r* were used to evaluate the relationship of tHRF to aHRF for each item, and Fisher's r to z (*z'*) were calculated for correlation coefficient comparisons of tHRF to aHRF. **Results:** K-2 females reported teaching (2.71±.78 vs., 2.43±.68, p=.048, d=.38) and assessing (1.62±.54, 1.41±.59, p=.049, d=.37) *fundamental movement skills* more than male counterparts and report assessing what they teach more than males (r=.48 female, r=.20 male, z'=1.96, p=.050). Female 6-8 grade teachers report teaching (tHRF=1.77±.93, vs. 1.44±.90, p=.004, d=.36) and assessing (aHRF=1.32±.60, vs. 1.17±.62, p=.042, d=.25) *self-monitoring PA* more than males and correlation of teaching to assessing was higher (r=.68 female, r=.49 male, z'=2.11, p=.035) for this HRF subtopic. Similar significant differences (p<.05) were apparent for *using fitness data to inform goal setting* and *personal PA planning* for both 6-8 and 9-12 grade, respectively. **Conclusion:** Teacher gender and grade-level may influence HRF instruction.

Keywords: Physical Education; PECAT; Assessment; Instructional Practices

1. INTRODUCTION

Lifetime physical activity (PA) is promoted worldwide due to notable increases in sedentary behavior seen among children in recent decades (World Health Organization, 2018). Recommendations that children participate in at least 60 minutes of moderate to vigorous PA (MVPA) are not new (Centers for Disease Control [CDC], 1997; U.S. Department of Health and Human Services [USDHHS], 2018; USDHHS, 2008), however children today remain significantly less physically active than previous generations (National Physical Activity Plan Alliance, 2018). In the United States (US) a respondent focus by many public health organizations, including the Society of Health and Physical Educators (SHAPE) America, is to encourage student *physical literacy* (Farrey & Isard, 2015) in schools in order to increase overall PA and reduce sedentary behavior among children. Physical literacy is defined as, "the ability, confidence, and desire to be physically active for life" (SHAPE America, 2018) and it is recommended that children learn to become physically literate in highly active, skill mastery climates (SHAPE America, n.d.).

Becoming physically literate also requires that individuals possess adequate knowledge of health-related fitness (HRF) and the complementary physical skills for participating in a variety of PA settings (Silverman & Mercier, 2015). It is recommended that adequate amounts of HRF learning should occur in school based physical education classes at each grade in K-12 (SHAPE America, 2014). Research indicates that children possessing greater HRF knowledge are significantly more active in and out of school (Chen et al., 2018; Ferkel et al., 2015) and are more likely to adopt habitual PA behavior throughout their lifespan (Fisher et al., 2005). Despite its role in promoting physical literacy, studies indicate student HRF knowledge and skills are deficient on average nationally (Keating et al., 2009), no doubt contributing to the lack of PA and increased sedentary behavior among US youth. In addition, disparities in PA behavior exist between males and females across every age classification (Althoff et al., 2017), including in physical education classes (Alderman et al., 2012), in other school PA opportunities such as recess (Erwin et al., 2012), and in before/after school programs (Strugnell et al., 2016).

In order to effectively promote student physical literacy, deliberate attempts to increase student HRF knowledge and skills are an important part of the physical education curriculum (Corbin, 2016). To that end, it is recommended that teachers utilize a standards-aligned curriculum, design class activities that maximize student learning of curricular objectives, and measure student learning with a variety of standards-aligned assessments (Dyson, 2014; Penney et al., 2009). Additionally, it is widely accepted that

teachers should offer a complete instructional cycle where student learning targets align with activities and assessments in order to elicit student growth (Black & Wiliam, 1998; Doty, 2008; Mitchell & Walton-Fisette, 2016), including HRF knowledge (Hastie et al., 2017). In physical education, the implementation of a complete instructional cycle has been a point of contention by academics and researchers (Rink, 2013), as it is common for some teachers to operate programs that lack a written curriculum (Lee et al., 2013), utilize ineffective teaching practices/activities (Lee et al., 2007), and fail to adequately assess grade level outcomes (Kern & Graber, 2018).

While many physical educators consider student HRF knowledge and skills to be essential content (Castelli & Williams, 2007; Santiago et al., 2012), evidence suggests that it may not be regularly taught in sufficient quantity by teachers in US schools (Hodges et al., 2017) and there may be differences in HRF instruction based on the gender of teachers and the grade level(s) they teach. For example, Author et al (2020) reported relatively low levels of teaching and assessing of student HRF knowledge by US physical educators, with female and elementary teachers reporting significantly greater teaching and assessing of student HRF knowledge than male and secondary counterparts. At this time, it is not well understood why these differences exist, but given a recent influx of fitness-oriented teaching recruits (Richards & Padaruth, 2017), it is important to explore factors that contribute to difference in practice. Though few physical education studies have considered differences in instruction based on the gender of the teacher and the grade level(s) they teach, this phenomenon has been observed among teachers in a range of non-physical education educational settings such as science (Greenfield, 1997), music instruction (Zhukov, 2012), education technology (Antonio et al., 2020; G. Zhou & Xu, 2007), and English language arts (Watson et al., 2019). Furthermore, broad examinations of state standardized tests also indicate differences in student achievement based on teacher gender and grade level (Dee, 2007), including significantly improved reading and mathematics performance when students are assigned a female teacher in middle and high school grades (Winters et al., 2013).

While student HRF knowledge and skill is critical to promoting physical literacy, little is known about factors associated with teachers' propensity to provide adequate HRF instruction in K-12 schools. Previous research suggests that physical education teachers' attitudes toward teaching HRF vary considerably (Kulinna & Silverman, 2000), and factors such as student contact time potentially impact their decisions about curriculum and assessment (Kern et al., 2019). The instructional quality and relative emphasis teachers place on specific content has the greatest impact on student learning in any content area (Day et al., 2007), thus teacher

behavior is a critical factor in students gaining HRF knowledge and skill. Recent research suggests that physical educators teach and assess student HRF knowledge and skills differently based on their gender and the grade level they teach (Author et al., 2020; Y. Zhou & Wang, 2019). These differences could result in relative disparities in student HRF knowledge and potentially their physical literacy, yet the extent to which these differences exist is unknown at this time. Additionally, no research has investigated how specific HRF topics are taught or assessed in K-12. For example, topics such as the importance of being physically active may be regularly taught in PE, however, other topics such as knowledge about self-monitoring and using fitness data for goalsetting may not be as prominent, though no less important to developing lifelong PA habits. Furthermore, little research is available regarding physical educators' alignment of instruction with assessment (e.g. instructional cycle), particularly with regard to HRF teaching and learning. The purpose of this study, therefore, was to examine gender and grade level differences in teaching and assessment of HRF subtopics among physical education teachers. Based on previous research we hypothesized that gender and/or grade level differences exist for the teaching and assessment of specific HRF subtopics and the relationship between HRF subtopic teaching and assessment also differs by gender and grade level. The latter being an indication of relative completeness of the instructional cycle (Doty, 2008).

2. METHODS

To examine grade level and gender differences with regard to teaching and assessing HRF topics, a survey was constructed based on the 2006 Physical Education Curriculum Analysis Tool (PECAT; Centers for Disease Control and Prevention [CDC], 2006) and distributed to a sample of US physical educators representing each of the SHAPE America regional districts. Institutional review board approval was received prior to distribution of the survey. The current study was part of a larger examination of teacher behavior with regard to HRF knowledge, physical activity, and teaching practices related to HRF knowledge (Author, 2020), and considers a separate set of data and research questions nested within the larger project. Data collection was completed in January 2018, and only the 2006 version of the PECAT was available at that time.

2.1 Participants

Initial recruitment of participants was achieved by first developing a nationally representative sample from which to send the survey. To accomplish this, one US state from each of the, then (August 2017) six, SHAPE America regional districts were randomly selected. The selected

states were: (a) Delaware [Eastern District], (b) Illinois [Midwest District], (c) Minnesota [Central District], (d) Utah [Southwest District], (e) Virginia [Southern District], and (f) Washington [Northwest District].

Following the selection of US states, a random sample of public schools serving kindergarten through twelfth grade was drawn per each state from the current National Center for Education Statistics, Common Core of Data (NCES; National Center for Education Statistics, n.d.) database. This sample of schools was stratified by grade level clusters that matched the clustering of the 2006 PECAT (e.g. Kindergarten – 2nd grade [K-2], 3rd – 5th grade [3-5], 6th – 8th grade [6-8], and 9th – 12th grade [9-12]) so that teachers could be distributed the corresponding grade level questions adapted from the PECAT instrument. Next, a teacher database was created by manually retrieving the workplace email addresses for physical education teachers from their publicly available school websites. This resulted in an overall sample frame of teachers (N = 3,305) to which the survey was sent via SurveyMonkey® In total, 863 teachers gave informed consent to participate (26% overall response rate) with 796 participants completing the entire survey (92% completion rate). Additionally, one-way analysis of variance (ANOVA) of the participants' school level demographics (% low income, teacher-student ratio, and locale) compared to the overall sample frame in the same categories revealed no significant (p<.05) differences on average. See Table 1 for participant demographics per grade level taught.

Table 1.

Participant and school demographics by grade level cluster

	Total *N* = 796	**K – 2nd grade**	**3rd – 5th grade**	**6th – 8th grade**	**9th -12th grade**
Gender					
Male	387	67	90	110	120
Female	409	94	110	104	101
Educational level					
Bachelor's degree	263	60	75	65	63
Graduate degree	533	101	125	149	158
Teaching experience					
< 5 years	66	20	13	17	16
6 – 10 years	103	28	28	24	23
11 – 19 years	250	48	63	70	69
20 – 29 years	254	47	65	74	68
30 or more years	123	18	31	29	45
School level variables					
% low-income	46.0%	45.1%	48.6%	45.1%	44.2%
Mean teacher/student ratio	17.5	17.4	17.9	17.6	16.9
Locale					
Urban	145	31	29	37	48
Suburban	360	76	79	98	107
Township	101	20	19	27	35
Rural	190	35	26	51	78

2.2 Instrument

The PECAT was designed to evaluate physical education programs regarding their inclusion of curriculum, content instruction, and assessment of grade level outcomes associated with 2004 SHAPE America national standards. The self-report PECAT instrument allows school administrators and other stakeholders to measure the relative effectiveness of their physical education programs in this regard, therefore it was chosen as a suitable measure of physical educators' self-report teaching and assessment of HRF knowledge and skills. The survey questionnaire was constructed by adapting the 2006 version of the PECAT (CDC, 2006) to a series of 16 items based on the grade level taught by each teacher. The 2006 PECAT was aligned with the 2004 SHAPE America grade level outcomes such that for each standard, four content analysis items for teaching and four items for assessment were included. In the 2004 standards, Standard 3 and 4 included HRF outcomes, thus all items from Standard 3 and 4 were adapted into the questionnaire for a total of 16-items (8 teaching HRF and 8 assessment of HRF). Four separate 16-item questionnaires were created, per each of the grade level clusters (K-2, 3-5, 6-8, and 9-12) and participants were directed using survey flow logic to the appropriate 16-item PECAT questionnaire.

The items related to teaching were set to a 4-point Likert scale for teaching HRF (tHRF) and a 3-point Likert scale for assessing HRF (aHRF). Corresponding items for tHRF and aHRF were included back-to-back to improve participants' ability to reflect on the frequency with which they perceived that they taught and assessed individual HRF topics. For example, teachers who completed the 6-8 questionnaire were asked, "To what extent do you teach your students the importance of using results of fitness assessments to establish personalized physical activity programs that reflect personal goals and interests?", with the next question asking, "Do you assess students' ability to use results of fitness assessments to establish personalized physical activity programs that reflect personal goals and interests?" Teaching related response choices (4-point) were: (a) I thoroughly teach this, (b) I mostly teach this, (c) I occasionally teach this, and (d) I do not teach this. Assessment related response choices (3-point) were: (a) Yes, regularly, (b) Yes, sometimes, and (c) No, not at all.

2.3 Analysis

A response-nonresponse analysis was initially conducted to control for potential response bias. Despite the survey having an acceptable response rate compared to other external national surveys (Lindemann, 2018), this process is important for increasing confidence in results when the response

rate drops below 80% (Thomas, 2009). Demographic data variables for schools in which teachers were employed were used to compare responders versus non-responders based on school level variables such as the percentage of low-income students served, number of teachers per student, and the relative school locale (e.g. urban, suburban, township, or rural). These variables were suitable for nonresponse analysis due to their known impact on survey responses (Goyder et al., 2002; Mertler, 2003). One-way analysis of variance (ANOVA) of school level demographics revealed no significant differences ($p < .05$) between respondents and non-respondents for any school level variables, thus nonresponse bias was unlikely (Groves, 2006).

Data cleaning, list-wise removal of incomplete data, and all further statistical analysis were conducted in STATA version 15.1 (College Station, TX). Mean and standard deviation (SD) for each participant on each tHRF and aHRF item per each grade level cluster. Initial examination of tHRF and aHRF included one-way ANOVA to determine if gender differences exist, and results revealed females reported significantly higher levels of teaching HRF compared to males ($\bar{x}$ = 14.8 vs. 13.9, F[2,794]=3.09, t=2.37, p=.009, [r=.09, d=.17]) and assess HRF overall greater than males, approaching significance ($\bar{x}$ = 9.7 vs. 9.3, F[2,794]=1.24, t=1.57, p=.058, [r=.06, d=.11]). Tukey's post hoc t-tests were conducted to further investigate gender and grade level differences in teaching and assessing specific HRF topics and control for type I error (Field, 2013).

Dependent paired samples t-tests for each HRF item were conducted between teachers within each grade level cluster (K-2, 3-5, 6-8, 9-12). Significance was set at $p < .05$ and Cohen's d were calculated as a measure of effect size. Pearson's r correlations were calculated for each tHRF item and its corresponding aHRF item to determine the strength of the relationship of teaching particular HRF topics with assessment of the HRF topic. Correlations of tHRF to aHRF (Pearson's r) for male teachers were compared to those for female teachers per each tHRF to aHRF paired topic by calculating Fisher's r to z (z') with corresponding p value significance accepted at $p < .05$. The Fisher's r to z transformation allows for comparison of two correlation coefficients from independent samples and considers the n of each sample independently. An online Fisher's r to z calculator (Weiss, 2011) was utilized for all cases.

3. RESULTS

The results of t-tests comparing mean tHRF and aHRF among male and female physical educators at similar grade level clusters revealed significant

differences with regard to specific HRF subtopics. Additionally, significant differences were noted in the correlation of tHRF to aHRF within specific HRF topics among male and female physical educators at similar grade levels. Results are disaggregated and reported by grade level cluster. See Tables 2-5 for additional details.

3.1 K – 2 Teachers

Among K-2 teachers, females (*n* = 94) reported teaching the topic *'teaching students to develop an ability to participate in activities that involve locomotion, nonlocomotion, and manipulating objects'* significantly greater than male counterparts, (2.71± .78 female, 2.43± .68 male, *p*=.048, *d*=.38), as well as reporting assessing this topic significantly more (1.62± .54 female, 1.41± .59 male, *p*=.049, *d*=.37). Female teachers demonstrated a higher correlation of reported teaching to assessing this topic, approaching statistical significance (*r*=.48 female, *r*=.20 male, *z'*=1.96, *p*=.050). While no difference existed for teaching or assessing the topic of *'identifying different types of physical activity such as student knowledge about moderate and vigorous activities in and out of PE class,'* female teachers reported a significantly higher correlation of teaching to assessing this topic (*r*=.68 female, *r*=.41 male, *z'*=2.41, *p*=.016). Female teachers also reported greater teaching (2.22± .91 female, 1.99± .90 male, *p*=.050, *d*=.25) and assessment (1.28± .69 female, 1.10± .63 male, *p*=.054, *d*=.27) of the topic, *'knowledge of the body's response to physical activity,'* approaching significance. Female teachers indicated teaching the topic *'personal choices in physical activity and knowledge of how choices contribute to physical fitness'* significantly more than males (1.98± .87 female, 1.75± .89 male, *p*=.049, *d*=.26), but no difference in assessment nor correlations of tHRF to aHRF were observed. All other topics revealed no significant differences in tHRF, aHRF, or correlations between the two.

Table 2.

Comparison of means and correlations of paired health-related fitness items from Kindergarten – 2nd grade PECAT.

Paired HRF items topic		Mean +/- SD of paired HRF items					Correlation of teaching to assessing of paired HRF items (Pearson's *r*, Fisher's *r*-z, p value)			
		Female (n = 94)	**Male (n = 67)**	***t***	***p***	***d***	**Female**	**Male**	***z'***	***p***
1. Identify different types of physical activity, such as student knowledge about moderate and vigorous activities in and out of PE class.	T	1.38 (.97)	1.40 (.97)	-1.29	.551	.02	.68	.41	2.41	**.016**
	A	1.10 (.67)	1.09 (.67)	.058	.477	.01				
2. Importance of choosing specific forms of physical activity and/or modifying activities they participate in during time outside of physical education.	T	1.78 (.94)	1.61 (.92)	1.10	.136	.18	.42	.43	-.07	.944
	A	.98 (.75)	.91 (.67)	.60	.276	.10				
3. Knowledge of the temporary and lasting health benefits of physical activity.	T	2.21 (.85)	2.03 (.83)	1.35	.089	.21	.59	.55	.36	.719
	A	1.22 (.69)	1.10 (.65)	1.10	.136	.18				
4. Ability to participate in activities that allow students to participate in activities that involve locomotion, nonlocomotion, and manipulation of objects (e.g., tossing balls, juggling).	T	2.71 (.78)	2.43 (.68)	1.66	**.048**	.38	.48	.20	1.96	.050*
	A	1.62 (.54)	1.41 (.59)	1.65	**.049**	.37				
5. Knowledge of the body's response to physical activity (e.g. increased heart rate, faster breathing, and sweating).	T	2.22 (.91)	1.99 (.90)	1.65	.050 *	.25	.58	.43	1.24	.215
	A	1.28 (.69)	1.10 (.63)	1.61	.054 *	.27				
6. Knowledge of the components of health-related fitness (e.g., cardiorespiratory, muscular endurance, muscular strength, flexibility, and body composition).	T	2.07 (1.0)	1.93 (1.0)	.90	.185	.14	.67	.77	-1.28	.201
	A	1.29 (.70)	1.19 (.63)	.87	.193	.15				
7. Moderate to vigorous physical activity levels during PE class.	T	2.13 (.85)	2.12 (.88)	.06	.476	.01	.51	.25	1.88	.060*
	A	1.11 (.67)	.99 (.56)	1.18	.120	.19				
8. Personal choices in physical activity and students' knowledge of how choices contribute to physical fitness.	T	1.98 (.87)	1.75 (.89)	1.66	**.049**	.26	.55	.35	1.55	.121
	A	.80 (.67)	.91 (.60)	-1.10	.864	.17				

Note: Paired HRF items represents the topic of paired questions related to teaching and assessing of a health-related fitness topics; T = teaching, A = assessing.

Correlations of teaching to assessing per each pair of HRF items were calculated as Pearson's r values and comparison of female to male correlations are represented as Fisher's r to z, noted as z'. **Bold** = statistically significant ($p < .05$). * = value is approaching statistical significance ($p < .05$) and may be practically significant.

3.2 3 – 5 Teachers

Among 3rd – 5th grade teachers, few significant differences in tHRF and aHRF, and no significant differences in correlations of tHRF to aHRF were observed. For, '*knowledge about different types of physical activities and the*

difference between moderate and vigorous activity students participate in during an outside physical education class,' males reported assessing significantly more than females (1.08± .59 female, 1.30± .59 male, p=.005, d=.37), but no difference existed in reported teaching this topic (1.40± .85 female, 1.53± .59 male, p=.143, d=.15). Female teachers reported assessing, '*knowledge of the components of fitness, tools for assessing personal fitness, and identifying physical activities that can assist in developing each of the components of health-related fitness'* greater than males (1.41± .64 female, 1.24± .62 male, p=.034, d=.27), however no significant difference was observed in teaching this topic (1.83± .1.07 female, 1.84± .99 male, p=.454, d=.01). No significant differences were observed in this group.

3.3 6 – 8 Teachers

The following topics were significantly different with females reporting both greater tHRF and aHRF: (a) *'identifying opportunities for participation in moderate to vigorous physical activities in both school and non-school settings'* (tHRF=2.20± .74 female, 1.98± .75 male, p=.016, d=.30) and (aHRF=1.32± .61 female, 1.13± .64 male, p=.013, d=.30), (b) *'using results of fitness assessments to establish personalized physical activity programs that reflect personal goals and interests'* (tHRF=2.05± .89 female, 1.79± .85 male, p=.016, d=.30) and (aHRF=1.45± .57 female, 1.25± .67 male, p=.011, d=.32), (c) *'ability to independently self-monitor and regulate physical activity behavior'* (tHRF=1.77± .93 female, 1.44± .90 male, p=.004, d=.36) and (aHRF=1.32± .60 female, 1.17± .62 male, p=.042, d=.25), (d) *'monitoring capacity to participate in activities for improving each component of fitness, without undue fatigue'* (tHRF=1.85± .89 female, 1.63± .90 male, p=.037, d=.25) and (aHRF=1.32± .60 female, 1.11±.61 male, p=.006, d=.35), and (e) *'knowledge of how each component of physical fitness is related to their overall fitness status'* (tHRF=2.11± .82 female, 1.93± .76 male, p=.041, d=.23) and (aHRF=1.32± .61 female, 1.17± .64 male, p=.038, d=.24). The only topic with significantly different tHRF to aHRF correlation was *'monitoring capacity to participate in activities for improving each component of fitness, without undue fatigue'* (r=.68 female, r=.49 male, z=2.11, p=.035).

Table 3.

Comparison of means and correlations of paired health-related fitness items from 3rd – 5th grade PECAT.

		Mean +/- SD of paired HRF items					Correlation of teaching to assessing of paired HRF items (Pearson's r, Fisher's r-z, p value)			
Paired HRF items topic		**Female (n = 110)**	**Male (n = 90)**	***t***	***p***	***d***	**Female**	**Male**	***z'***	***p***
1. Knowledge about different types of physical activities and the difference between moderate and vigorous activity they participate in during an outside physical education class.	T	1.40 (.85)	1.53 (.91)	-1.07	.143	.15	.50	.62	-1.22	.222
	A	1.08 (.59)	1.30 (.59)	-2.60	**.005**	.37				
2. Importance of choosing specific forms of physical activity and/or modifying activities to match individual abilities.	T	1.77 (.85)	1.78 (.93)	-.03	.516	.01	.41	.44	-.25	.803
	A	1.38 (.64)	1.36 (.62)	.29	.384	.03				
3. Knowledge of the health-related benefits and mental health benefits of physical activity.	T	1.90 (.97)	1.86 (.98)	.32	.374	.04	.58	.66	-.91	.368
	A	1.12 (.67)	1.08 (.66)	.43	.335	.06				
4. How to incorporate self-assessment into physical activity through a variety of sources, such as pedometers, a physical activity log, or heart rate monitors.	T	1.11 (1.02)	1.23 (.98)	-.87	.192	.12	.37	.35	.16	.873
	A	1.07 (.66)	1.04 (.72)	.29	.386	.04				
5. Knowledge of the components of fitness, tools for assessing personal fitness, and identifying physical activities that can assist in developing each of the components of health-related fitness.	T	1.83 (1.07)	1.84 (.99)	-.11	.454	.01	.57	.55	.21	.842
	A	1.41 (.64)	1.24 (.62)	1.83	**.034**	.27				
6. Definition of the components of fitness and appropriate use of tools for assessing each fitness component, including FITT principle.	T	1.93 (.97)	1.88 (1.01)	.35	.363	.05	.55	.59	-.41	.682
	A	.95 (.69)	.97 (.63)	-.23	.411	.03				
7. Conduct self-assessment and initiate self-improvement for physical activity and fitness, such as completing a fitness test and identifying strengths and weaknesses, and ways to improve.	T	1.86 (.82)	1.90 (.79)	-.32	.376	.05	.45	.43	.17	.865
	A	1.22 (.68)	1.17 (.64)	.55	.293	.08				
8. Interpreting fitness test results and choosing appropriate activities to improve each component of physical fitness.	T	1.62 (1.01)	1.50 (.96)	.83	.201	.12	.57	.70	-1.52	.129
	A	.95 (.62)	1.04 (.67)	-1.09	.139	.14				

Note: Paired HRF items represents the topic of paired questions related to teaching and assessing of a health-related fitness topics; T = teaching, A = assessing.
Correlations of teaching to assessing per each pair of HRF items were calculated as Pearson's r values and comparison of female to male correlations are represented as Fisher's r to z, noted as z'. **Bold** = statistically significant ($p < .05$).

Table 4.

Comparison of means and correlations of paired health-related fitness items from 6th – 8th grade PECAT.

		Mean +/- SD of paired HRF items					Correlation of teaching to assessing of paired HRF items (Pearson's *r*, Fisher's *r*-z, p value)			
Paired HRF items topic		**Female (n = 104)**	**Male (n = 110)**	***t***	***p***	***d***	**Female**	**Male**	**z'**	***p***
1. Identify opportunities for participation in moderate to vigorous physical activities in both school and non-school settings.	T	2.20 (.74)	1.98 (.75)	2.15	**.016**	.30	.45	.39	.53	.596
	A	1.32 (.61)	1.13 (.64)	2.25	**.013**	.30				
2. Use results of fitness assessments to establish personalized physical activity programs that reflect personal goals and interests.	T	2.05 (.89)	1.79 (.85)	2.17	**.016**	.30	.60	.59	.11	.912
	A	1.45 (.57)	1.25 (.67)	2.31	**.011**	.32				
3. Knowledge about basic concepts/principles of training and how to apply them when establishing personal physical activity goals.	T	1.74 (.93)	1.65 (.80)	.80	.212	.10	.49	.43	.55	.582
	A	1.39 (.60)	1.24 (.62)	1.71	**.045**	.25				
4. Ability to independently self-monitor and regulate physical activity behavior.	T	1.77 (.93)	1.44 (.90)	2.66	**.004**	.36	.57	.50	.71	.477
	A	1.32 (.60)	1.17 (.62)	1.74	**.042**	.25				
5. Knowledge of and ability to assess personal fitness status for each component of fitness and use this information to develop individualized physical fitness goals.	T	1.86 (.93)	1.67 (.85)	1.59	.058*	.21	.63	.57	.68	.497
	A	1.28 (.63)	1.17 (.59)	1.27	.102	.18				
6. Knowledge about basic principles of training (e.g., threshold, overload, specificity) and how to apply the principles to their own programs for improving personal fitness.	T	1.19 (.95)	1.10 (.97)	.71	.241	.09	.77	.70	1.11	.271
	A	.87 (.61)	.76 (.60)	1.23	.111	.18				
7. Monitor capacity to participate in activities for improving each component of fitness, without undue fatigue.	T	1.85 (.89)	1.63 (.90)	1.79	**.037**	.25	.68	.49	2.11	**.035**
	A	1.32 (.60)	1.11 (.61)	2.52	**.006**	.35				
8. Knowledge of how each component of physical fitness is related to their overall fitness status.	T	2.11 (.82)	1.93 (.76)	1.74	**.041**	.23	.47	.51	-.38	.704
	A	1.32 (.61)	1.17 (.64)	1.79	**.038**	.24				

Note: Paired HRF items represents the topic of paired questions related to teaching and assessing of a health-related fitness topics; T = teaching, A = assessing.
Correlations of teaching to assessing per each pair of HRF items were calculated as Pearson's *r* values and comparison of female to male correlations are represented as Fisher's *r* to z, noted as z'. **Bold** = statistically significant ($p < .05$). * = value is approaching statistical significance ($p < .05$) and may be practically significant.

3.4 9 – 12 Teachers

Few gender significant differences in tHRF and aHRF were observed and no significant correlations between tHRF and aHRF were apparent. Females reported teaching the topic '*how to independently develop and implement a personal physical activity program, based upon self-assessed physical activity and fitness, and personal choices and interests'* significantly more

than male teachers (2.11± .88 female, 1.90± .86 male, p=.039, d=.24) but no differences existed in assessment of this topic (1.33± .65 female, 1.28± .61 male, p=.271, d=.08).

Table 5.

Comparison of means and correlations of paired health-related fitness items from 9th – 12th grade PECAT.

		Mean +/- SD of paired HRF items					Correlation of teaching to assessing of paired HRF items (Pearson's *r*, Fisher's *r*-z, p value)			
Paired HRF items topic		**Female (n = 100)**	**Male (n = 120)**	***t***	***p***	***d***	**Female**	**Male**	***z'***	***p***
1. Knowledge about why patterns of participation in moderate and vigorous physical activity change over the life-span and how much activity is recommended for their age and for adults.	T	1.78 (.91)	1.79 (.92)	-.09	.462	.01	.65	.70	-.67	.503
	A	1.06 (.68)	1.17 (.69)	-1.16	.123	.16				
2. How to independently develop and implement a personal physical activity program, based upon self-assessed physical activity and fitness, and personal choices and interests.	T	2.11 (.88)	1.90 (.86)	1.77	**.039**	.24	.69	.60	1.13	.259
	A	1.33 (.65)	1.28 (.61)	.61	.271	.08				
3. How to independently apply training principles to their own participation in their favorite activities and/or sports.	T	1.84 (.85)	1.85 (.85)	-.07	.471	.01	.57	.61	-.45	.653
	A	1.13 (.63)	1.24 (.59)	-1.37	.086	.18				
4. Monitoring physical activity and use of appropriate behavior change strategies for improvement (e.g., goal setting, identifying social support systems).	T	1.95 (.88)	1.84 (.90)	.91	.183	.12	.68	.70	-.28	.780
	A	1.28 (.68)	1.26 (.60)	.22	.413	.03				
5. Knowledge of appropriate activities for each component of fitness, as well as activities that will help students meet their personal fitness goals.	T	2.30 (.76)	2.13 (.81)	1.63	.053*	.22	.62	.52	1.08	.280
	A	1.49 (.56)	1.42 (.57)	.89	.186	.12				
6. Knowledge of basic exercise physiology concepts (neuromuscular function, cardiorespiratory adaptations, and principles of training for competitive sports or recreational activities).	T	1.37 (1.05)	1.43 (.93)	-.51	.308	.06	.56	.38	1.70	.089
	A	1.18 (.62)	1.16 (.57)	.25	.402	.03				
7. Knowledge of age- and gender-appropriate health-related fitness standards and how to monitor and interpret personal fitness data.	T	1.76 (.98)	1.50 (.95)	2.05	**.021**	.27	.67	.54	1.50	.134
	A	1.32 (.65)	1.26 (.54)	.73	.233	.10				
8. Developing a personal health-related fitness program, including an analysis of personal fitness goals and the viability of the program to meet goals.	T	1.89 (.95)	1.69 (.89)	1.53	.064*	.22	.59	.49	1.03	.303
	A	1.19 (.64)	1.13 (.59)	.76	.224	.10				

Note: Paired HRF items represents the topic of paired questions related to teaching and assessing of a health-related fitness topics; T = teaching, A = assessing. Correlations of teaching to assessing per each pair of HRF items were calculated as Pearson's *r* values and comparison of female to male correlations are represented as Fisher's *r* to z, noted as z'. * = value is approaching statistical significance (p < .05) and may be practically significant.

Likewise, females indicated teaching the topic, '*knowledge of age- and gender-appropriate health-related fitness standards and how to monitor and interpret personal fitness data'* significantly more than males (1.76± .98 female, 1.50± .95 male, p=.021, d=.27) and no difference in assessment of this topic (1.32± .65 female, 1.26± .54 male, p=.233, d=.10). Two subtopics approached significance in gender differences with female teachers reporting

greater tHRF: (a) *'knowledge of appropriate activities for each component of fitness, as well as activities that will help students meet their personal fitness goals'* (2.30± .76 female, 2.13± .81 male, p=.053, d=.22) and (b) *'developing a personal health-related fitness program, including an analysis of personal fitness goals and the viability of the program to meet goals'* (1.89± .95 female, 1.69± .89 male, p=.064, d=.22).

4. DISCUSSION

The purpose of this study was to determine whether gender and/or grade level differences exist with regard to physical educators' teaching and assessment of specific HRF subtopics, as well as the relationship of their teaching to assessment practices. It was hypothesized that there would be gender and grade level differences in teaching and assessing behaviors, and the results confirm this hypothesis overall, with more pronounced differences in some HRF subtopics. Female teachers at each grade level cluster reported teaching HRF concepts significantly more than their male counterparts in at least one HRF subtopic, though at some grade levels such as 3rd-5th and 9th-12th, these differences were minor. The highest concentration of differences was seen among teachers of K-2nd and 6th-8thgrade students, and in many cases, female teachers also reported assessing student learning HRF content to a greater extent, suggesting they may be implementing a more complete instructional cycle with regard to HRF compared to males. The highest concentration of differences was seen among teachers of K-2nd, 6th-8th, and 9th-12th grade students, and in many cases, female teachers also reported assessing student learning HRF content to a greater extent, suggesting they may be implementing a more complete instructional cycle with regard to HRF compared to males.

While these self-reported teaching and assessing differences were apparent, it is not abundantly clear why they exist. Research on PA levels consistently show females to be less physically active than males in nearly every age grouping (Althoff et al., 2017), and analysis of portions of the larger study data from which data in the current study were drawn (i.e. Author et al., 2020) showed that personal PA behavior was more predictive overall of teaching and assessing HRF than actual HRF knowledge. Despite this previous finding, current study data seem somewhat contradictory and suggest that female physical educators, though less physically active themselves, may be more committed to HRF instruction and assessment than their male counterparts. This phenomenon could be seen as a part of a larger discussion about gender differences in teaching effectiveness, which has not been conclusive in the general education literature (Cho, 2012). In physical education, topics such as contact sports are more traditionally associated with masculinity while aesthetic activities such as dance are more often seen as feminine (Evans, 2017); which may suggest why specific

content to be taught in physical education classes is also preferred by males and females differently, potentially resulting in teaching disparities. The differences may also be related to females having more competence in teaching HRF content, thus putting more emphasis on student learning and implementing more effective instructional techniques. Until now, this association has not been specifically been identified with regard to the teaching of HRF concepts, however, gender preferences for different types of fitness exercises are known to exist (Craft et al., 2014), thus gender differences may also drive the teaching of fitness concepts to some extent.

Another interesting finding were the differences in participants' reported teaching and assessing of certain HRF subtopics. Specifically, it was observed that K-2 physical educators reported higher teaching, assessing, and correlation of teaching to assessing of students' ability to participate in locomotion, non-locomotion activities, and manipulation skills. These fundamental movement skills (FMS) are critical for developing lifelong movement capacity and are strongly linked to increased habitual physical activity (Jaakkola et al., 2016). Given the difference in reported instructional practices, students in the physical education classes of the male teachers included in this study may experience less FMS skill development along with HRF knowledge. Additionally, K-2 female teachers indicated higher teaching to assessing ratios compared to males related to students' identification of PA types and opportunities in and outside of school. This disparity could potentially mean that students of male teachers participate in less PA overall than students of female teachers, though actual PA levels were beyond the scope of this study.

Reported instructional differences between males and females were most pronounced among secondary school teachers (grades 6-8 & 9-12), and particularly with regard to self-monitoring fitness level, and using fitness results for personal PA planning. Within 6^{th} – 8^{th} grade teachers, females indicated teaching or assessing to a significantly greater extent on seven out of the eight HRF subtopics, which collectively related primarily to students' learning to monitor their personal fitness and use data in fitness goal setting and PA planning. Similarly, 9^{th} – 12^{th} female teachers reported teaching their students significantly more often how to monitor and interpret personal fitness data to develop and implement a personalized PA program. These findings indicate that students in roughly half the secondary schools represented in this study may be receiving reduced instruction about how to achieve and maintain a healthy level of physical fitness. This lack of knowledge for personal fitness and PA planning could have a lasting effect on students, especially since it occurs at a time point near their exit from K-12 where a good deal of adult PA habits are established (Jaakkola et al., 2016).

Despite the novel findings, there are limitations worth noting. First, this study provides a cross-sectional snapshot of how teachers viewed their instruction at the time of data collection and utilizes self-report measures of both teaching and assessment of HRF topics. It is possible that physical educators may have expressed their perspectives about the extent to which they teach/assess (e.g. thoroughly vs. mostly) content in their classes differently, leading to possible inaccuracies during comparison. This limitation, however, is minimized by the large sample size and wide range of settings and locations from which the sample was drawn. Additionally, like all survey research, social desirability of responses can be a threat to validity. It is well documented that males and females tend to estimate their abilities and accomplishments differently (Szymanowicz & Furnham, 2013), with males tending to overestimate and females underestimating. The males in this study, however, rated their teaching/assessing lower than female counterparts, which would logically be less socially desirable, therefore inflation of scores due to social desirability bias would seem unlikely (Larson, 2019).

5. CONCLUSION

HRF knowledge is one deliverable component of PE that can potentially transcend beyond the school day and promote lifetime PA. To fully realize this benefit, however, teachers must utilize high quality instructional practices including effective teaching and assessment of student learning. This study illuminates a somewhat overlooked issue in physical education such that roughly half the students nationwide (e.g. those with male physical education teachers) may be receiving considerably less volume of HRF instruction related to HRF. This difference appears less dramatic in upper elementary and high school than primary and middle grades, which may mean that the fitness concepts that are taught at each level may deserves greater consideration. At any rate, these instructional differences between genders and grade levels have potential to result in disparities in lifelong PA, and it is critical to better understand the reasons for their existence. Future research should explore reasons for differences in physical education instruction related to teacher gender and grade level taught. Additionally, physical education teacher education (PETE) programs should strengthen programming that focuses on preservice teachers' alignment of teaching with assessment regardless of content that is taught and consider gender differences in the design and modification of the PETE program.

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None.

6.2 Conflict of Interest (de-identify in blinded manuscript)

The authors declare no conflicts of interest.

6.3 Contribution of Authors (exclude in blinded manuscript)

SAI: study design, manuscript preparation, data collection, data analysis, and manuscript editing. BDK: study design, manuscripts preparation, data analysis, and manuscript editing. JC: manuscript preparation and data analysis

7. REFERENCES

Alderman, B. L., Benham-Deal, T., Beighle, A., Erwin, H., & Olson, R. (2012). Physical education's contribution to daily physical activity among middle school youth. *Pediatric Exercise Science*, *24*, 634–648.

Althoff, T., Sosič, R., Hicks, J. L., King, A. C., Delp, S. L., & Leskovec, J. (2017). Large-scale physical activity data reveal worldwide activity inequality. *Nature*, *547*(7663), 336–339. https://doi.org/10.1038/nature23018

Antonio, A., Probitchado, R., Ricohermoso, C., Saavedra, A., & de la Rama, J. (2020). Gender differences in technological competence among science teachers: Implications. *International Journal of Advanced Science and Technology*, *29*(7), 13257–13268.

Black, P., & Wiliam, D. (1998). Assessment and classroom learning. *Assessment in Education: Principles, Policy & Practice*, *5*(1), 7–74.

Castelli, D., & Williams, L. (2007). Health-related fitness and physical education teachers' content knowledge. *Journal of Teaching in Physical Education*, *26*, 3–19.

CDC. (1997). Guidelines for school and community programs to promote lifelong physical activity among young people. *Morbidity and Mortality Weekly Report*, *46*(No. RR-6).

Centers for Disease Control and Prevention. (2006). *Physical education curriculum analysis tool*. Centers for Disease Control and Prevention. https://www.cdc.gov/healthyschools/pecat/pdf/pecat.pdf

Chen, W., Hammond-Bennett, A., Hypnar, A., & Mason, S. (2018). Health-related physical fitness and physical activity in elementary school students. *BMC Public Health*, *18*(1), 195. https://doi.org/10.1186/s12889-018-5107-4

Cho, I. (2012). The effect of teacher–student gender matching: Evidence from OECD countries. *Economics of Education Review*, *31*(3), 54–67. https://doi.org/10.1016/j.econedurev.2012.02.002

Corbin, C. B. (2016). Implications of physical literacy for research and practice: A commentary. *Research Quarterly for Exercise and Sport*, *87*(1), 14–27. https://doi.org/10.1080/02701367.2016.1124722

Craft, B. B., Carroll, H. A., & Lustyk, M. K. B. (2014). Gender differences in exercise habits and quality of life reports: Assessing the moderating effects of reasons for exercise. *International Journal of Liberal Arts and Social Science*, *2*(5), 65–76.

Day, C., Sammons, P., Stobart, G., Kington, A., & Gu, Q. (2007). *Teachers matter: Connecting lives, work and effectiveness*. Mc Graw Hill.

Dee, T. S. (2007). Teachers and the gender gaps in student achievement. *Journal of Human Resources*, *XLII*(3), 528–554. https://doi.org/10.3368/jhr.XLII.3.528

Doty, G. (2008). *Focused assessment: Enriching the instructional cycle*. Solution Tree Press.

Dyson, B. (2014). Quality physical education: A commentary on effective physical education teaching. *Research Quarterly for Exercise and Sport*, *85*, 144–152.

Erwin, H., Abel, M., Beighle, A., Noland, M. P., Worley, B., & Riggs, R. (2012). The contribution of recess to children's school-day physical activity. *Journal of Physical Activity and Health*, *9*, 442–448.

Evans, J. (2017). *Equality, education and physical education*. Routledge. https://www.taylorfrancis.com/books/e/9781315399867

Farrey, T., & Isard, R. (2015). *Physical literacy in the United States: A model, strategic plan, and call to action* (pp. 1–35). Aspen Institute Sports and Society Program. https://www.aspeninstitute.org/publications/physical-literacy-model-strategic-plan-call-action/

Ferkel, R. C., Stodden, D. F., Judge, L. W., Griffin, K., & Hamman, D. (2015). Relationship between health-related fitness knowledge and physical fitness. *International Journal of Physical Education, Sports and Health*, *1*(6), 76–82.

Field, A. (2013). *Discovering statistics using IBM SPSS Statistics* (4th ed.). Sage.

Fisher, A., Reilly, J. J., Kelly, L. A., Montgomery, C., Williamson, A., Paton, J. Y., & Grant, S. (2005). Fundamental movement skills and habitual physical activity in young children. *Medicine & Science in Sports & Exercise*, *37*(4), 684–688. https://doi.org/10.1249/01.MSS.0000159138.48107.7D

Goyder, J., Warriner, K., & Miller, S. (2002). Evaluating socio-economic status (SES) bias in survey nonresponse. *Journal of Official Statistics*, *18*(1), 1–11.

Greenfield, T. A. (1997). Gender- and grade-level differences in science interest and participation. *Science Education*, *81*(3), 259–276. https://doi.org/10.1002/(SICI)1098-237X(199706)81:3<259::AID-SCE1>3.0.CO;2-C

Groves, R. M. (2006). Nonresponse rates and nonresponse bias in household surveys. *Public Opinion Quarterly*, *70*(5), 646–675.

Hastie, P. A., Chen, S., & Guarino, A. J. (2017). Health-related fitness knowledge development though project-based learning. *Journal of Teaching in Physical Education*, *36*(1), 119–125.

Hodges, M., Hodges Kulinna, P., Lee, C., & Kwon, J. Y. (2017). Professional development and teacher perceptions of experiences teaching health-related fitness knowledge. *Journal of Teaching in Physical Education*, *36*, 32–39. https://doi.org/10.1123/jtpe.2016-0107

Jaakkola, T., Yli-Piipari, S., Huotari, P., Watt, A., & Liukkonen, J. (2016). Fundamental movement skills and physical fitness as predictors of

physical activity: A 6-year follow-up study: Motor skills, fitness, and physical activity. *Scandinavian Journal of Medicine & Science in Sports*, *26*(1), 74–81. https://doi.org/10.1111/sms.12407

Keating, X. D., Harrison, L., Chen, L., Xiang, P., Lambdin, D., Dauenhauer, B., Rotich, W., & Piñero, J. C. (2009). An analysis of research on student health-related fitness knowledge in K – 16 physical education programs. *Journal of Teaching in Physical Education, 28*(3), 333–349.

Kern, B. D., & Graber, K. C. (2018). Understanding teacher change: A national survey of U.S. physical educators. *Research Quarterly for Exercise and Sport*, *89*, 80–90. https://doi.org/10.1080/02701367.2017.1411579

Kern, B. D., Graber, K. C., Woods, A. M., & Templin, T. J. (2019). The influence of socializing agents and teaching context among teachers of different dispositions toward change. *Journal of Teaching in Physical Education*, *38*, 252–261. https://doi.org/10.1123/jtpe.2018-0175

Kulinna, P. H., & Silverman, S. (2000). Teachers' attitudes toward teaching physical activity and fitness. *Research Quarterly for Exercise and Sport*, *71*(1), 80–84. https://doi.org/10.1080/02701367.2000.10608884

Larson, R. B. (2019). Controlling social desirability bias. *International Journal of Market Research*, *61*(5), 534–547. https://doi.org/10.1177/1470785318805305

Lee, S. M., Burgeson, C. R., Fulton, J. E., & Spain, C. G. (2007). Physical education and physical activity: Results from the school health policies and programs study 2006. *Journal of School Health*, *77*(8), 435–463. https://doi.org/10.1111/j.1746-1561.2007.00229.x

Lee, S. M., Hihiser, A. J., Fulton, J. E., Borgogna, B., & Zavacky, F. (2013). *Physical education and physical activity: Results from the School Health Policies and Practices Study 2012*. U. S. Department of Health and Human Services, Centers for Disease Control and Prevention.

Lindemann, N. (2018). *What's the average survey response rate? [2018 benchmark]*. SurveyAnyplace.Com.

Mertler, C. A. (2003). Patterns of response and nonresponse from teachers to traditional surveys. *Practical Assessment, Research & Evaluation*, *8*, 1–9.

Mitchell, S. A., & Walton-Fisette, J. L. (2016). *The essentials of teaching physical education: Curriculum, instruction, and assessment*. Human Kinetics.

National Center for Education Statistics. (n.d.). In *Search for public schools*. U. S. Department of Education, Common Core of Data. https://nces.ed.gov/ccd/schoolsearch/

National Physical Activity Plan Alliance. (2018). *The 2018 United States report on physical activity for children and youth*. National Physical Activity Plan Alliance.

http://physicalactivityplan.org/projects/PA/2018/2018%20US%20Report%20Card%20Full%20Version_WEB.PDF?pdf=page-link
Penney, D., Brooker, R., Hay, P., & Gillespie, L. (2009). Curriculum, pedagogy and assessment: Three message systems of schooling and dimensions of quality physical education. *Sport, Education and Society*, *14*, 421–442.
Richards, K. A. R., & Padaruth, S. (2017). Motivations for pursuing a career in physical education: The rise of a fitness orientation. *Journal of Physical Education, Recreation & Dance*, *88*(4), 40–46. https://doi.org/10.1080/07303084.2017.1280438
Rink, J. E. (2013). Measuring teaching effectiveness in physical education. *Research Quarterly for Exercise and Sport*, *84*(4), 407–418.
Santiago, J. A., Disch, J. G., & Morales, J. (2012). Elementary physical education teachers' content knowledge of physical activity and health-related fitness. *The Physical Educator*, *69*, 395–412.
Services, U. S. D. of H. and H. (2008). *Physical activity guidelines for Americans*. U.S. Department of Health and Human Services.
SHAPE America. (n.d.). *Physical literacy: How does physical literacy connect to PE + PA*. SHAPE America. Retrieved December 7, 2020, from https://www.shapeamerica.org/events/physicalliteracy.aspx
SHAPE America. (2014). *National standards and grade-level outcomes for K-12 physical education*. Human Kinetics. https://www.shapeamerica.org/standards/pe/
SHAPE America. (2018). *Defining literacy in health education and physical education*. https://www.shapeamerica.org/events/healthandphysicalliteracy.aspx
Silverman, S., & Mercier, K. (2015). Teaching for physical literacy: Implications to instructional design and PETE. *Journal of Sport and Health Science*, *4*(2), 150–155. https://doi.org/10.1016/j.jshs.2015.03.003
Strugnell, C., Turner, K., Malakellis, M., Hayward, J., Foster, C., Millar, L., & Allender, S. (2016). Composition of objectively measured physical activity and sedentary behaviour participation across the school-day, influence of gender and weight status: Cross-sectional analyses among disadvantaged Victorian school children. *BMJ Open*, *6*(9), e011478. https://doi.org/10.1136/bmjopen-2016-011478
Szymanowicz, A., & Furnham, A. (2013). Gender and gender role differences in self- and other-estimates of multiple Intelligences. *The Journal of Social Psychology*, *153*(4), 399–423. https://doi.org/10.1080/00224545.2012.754397
Thomas, K. J. (2009). Conducting nonresponse bias analysis for two business surveys at the U.S. Census Bureau: Methods and (some) results. *Proceedings of the Section On Survey Research Methodology*.

U.S. Department of Health and Human Services. (2018). *2018 Physical activity guidelines advisory committee scientific report*. U.S. Department of Health and Human Services.

Watson, P. W. St. J., Rubie-Davies, C. M., Meissel, K., Peterson, E. R., Flint, A., Garrett, L., & McDonald, L. (2019). Teacher gender, and expectation of reading achievement in New Zealand elementary school students: Essentially a barrier? *Gender and Education*, *31*(8), 1000–1019. https://doi.org/10.1080/09540253.2017.1410108

Weiss, B. A. (2011). *Fisher's r-to-Z transformation calculator to compare two independent samples*.

Winters, M. A., Haight, R. C., Swaim, T. T., & Pickering, K. A. (2013). The effect of same-gender teacher assignment on student achievement in the elementary and secondary grades: Evidence from panel data. *Economics of Education Review*, *34*, 69–75. https://doi.org/10.1016/j.econedurev.2013.01.007

World Health Organization. (2018). *Obesity and overweight*. http://www.who.int/news-room/fact-sheets/detail/obesity-and-overweight

Zhou, G., & Xu, J. (2007). Adoption of educational technology: How does gender matter? *International Journal of Teaching and Learning in Higher Education*, *19*(2), 140–153.

Zhou, Y., & Wang, L. (2019). Correlates of physical activity of students in secondary school physical education: A systematic review of literature. *BioMed Research International*, *2019*, 1–12. https://doi.org/10.1155/2019/4563484

Zhukov, K. (2012). Teaching strategies and gender in higher education instrumental studios. *International Journal of Music Education*, *30*(1), 32–45. https://doi.org/10.1177/0255761411431392