



Health-Related Fitness Knowledge of Middle School Students in Public and Private Schools

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ABSTRACT The purpose of this study is to examine public and private middle school students' levels of Health-Related Fitness Knowledge (HRFK) according to school type, gender, and grade. A cross-sectional survey method was applied in the research. A total of 334 public middle school students ($n_{\text{female}} = 154$ and $n_{\text{male}} = 180$) and 386 private middle school students ($n_{\text{female}} = 187$ and $n_{\text{male}} = 199$) participated in the survey. The data collection instrument was developed by Hunuk and Ince (2010) based on the "Superkids-Superfit Knowledge" study (Mott, Virgilio, Warren and Berenson, 1991). The data collected was analysed using the following descriptive and non-parametric tests: the Pearson chi-square, Mann-Whitney U-test, and Kruskal-Wallis H-test. Findings indicated a significant difference according to school type and age group ($p < .05$), but a non-significant difference according to gender and HRFK test result. Results improved year to year except among 7th graders. In other words, private middle school students' HRFK results were higher than those of public middle school students; grade level was also linked to HRFK, but gender was not. These results suggest that physical education curriculums should be developed with reference to HRFK objectives. Another recommendation would be that HRFK tools be customized by grade level in the Turkish context.

KEY WORDS Health-Related Fitness Knowledge, Middle School, Students, Physical Education.



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HEALTH-RELATED FITNESS KNOWLEDGE

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Introduction

At present, it is understood that a significant contributing factor in the rise of chronic diseases such as obesity, cardiovascular disease, hypertension, diabetes and osteoporosis is a lack of physical activity (PA). Insufficient information about PA and its importance for well-being have contributed to a shift towards increasingly sedentary lifestyles (Centers for Disease Control and Prevention (CDC), 2004; United States Department of Health and Human Services [USDHHS], 2000). Gutin et al. (1992) define physical fitness (PF) as the ability to successfully perform necessary physical activities. PF involves both health-related and skill-related factors. Components of health-related physical fitness (HRPF) are considered to include cardiovascular endurance, muscular strength and endurance, body composition and flexibility, while components of performance-related physical fitness (PRPF) include (in addition to the above) agility, strength, speed and balance (Pate, 1983; Looney & Plowman, 1990; Gutin et al., 1992; Bouchard et al., 1994; Ozer, 2001). The relationship between physical activity and well-being has been the subject of research in several previous studies (e.g. Hardman & Stensel, 2009). In these studies, the frequency, severity, duration and type of PA required to maintain or improve individuals' health-related physical fitness levels are explored for each of these components (Hoffman, 2006).

It is known that individuals who regularly engage in physical activity become less sick, are more energetic, feel psychologically better, and experience better general health (Corbin & Lindsey, 1990; Corbin & Pangrazi, 1993). Several scientific studies have suggested that adolescents require at least one hour of physical activity daily in order to remain healthy (World Health Organization, 2010; Janssen & LeBlanc, 2010; Turkish Ministry of Health, Basic Healthcare Services General Directorate, 2011). It has also been observed that students' level of physical activity decreases significantly during adolescence (CDC, 2004; USDHHS, 2000). Hager (2006) points out that adults and children experience various health problems, including cardiovascular disease, as

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a result of inactivity combined with an increase in energy intake. Van Sluijs et al. (2008) also submit that as a result of advanced technology, physical activity levels have decreased alarmingly and that immediate measures need to be taken. Since health problems result from decreased physical activity, and inadequate nutrition and stress increase with age, the negative impacts of these on states will be workforce loss, increased healthcare expenditures, and adversely affected national budgets. Globally, this situation has become one of the most critical education and healthcare policy priorities; developed and developing countries alike are encouraging people to cultivate healthy lifestyle habits (Turkish National Burden of Disease, 2004; WHO, 2010).

Recently, the Turkish physical education (PE) curriculum was updated with health-related objectives and standards (NASPE, 2004; MoNE, 2007, 2013). When the PE curriculums implemented at primary, middle, and high schools in Turkey are explored, it is observed that HRFK is included within the “Active and Healthy Living” learning domain for primary and middle schools, and within the “Personal Development and Healthy Living” sub-domain in the high school curriculum. Within the scope of HRFK domains and sub-domains, along with developing the habit of participating in physical activities eagerly and regularly, students are also expected to improve their knowledge of health-related physical fitness. (MoNE, 2009, 2013). Improving Health-Related Fitness Knowledge (HRFK) might be the first step in establishing healthy PA behaviours (Castelli & Williams, 2007; Keating et al., 2009a). HRFK is described as the knowledge of individuals’ ability to perform PA and protect themselves from chronic diseases (Keating et al., 2009a).

Studies suggest that there are significant pieces of missing or faulty information in students’ HRFK (Placek et al., 2001). Moreover, it is identified that the HRFK levels of primary and middle school students are well below the levels specified in the physical education learning objectives (Keating et al., 2009b). Another empirical study reports that minimal improvements have been made in students’ HRFK levels, or in their cardiovascular endurance (Mott, Virgilio, Warren & Berenson, 1991). In a study conducted on African-American adolescents, Lewis-Moss et al. (2009) identified a meaningful relationship between health knowledge and actual exercise. Physical Fitness Knowledge scales were developed to evaluate middle and high school students by grade (Teatro, Kulinna, Zhu, Boiarskaia, & Wilde, 2013). In another study conducted on a sampling of high school students, male students reportedly found participating in exercise more meaningful in terms of well-being than female students did (Al-Amari & Ziab, 2012). Moreover, in the review article of Demetriou, Sudeck, Thiel, and Honer (2015), interventional HRFK designs were found to have high rates (79.4%) of success, especially among adolescents.

Research on HRFK for the Turkish context is limited and has mostly been undertaken in middle schools. Hunuk and Ince (2010) developed the Superkids-Superfit Knowledge Test according to Turkish physical education curriculum standards (MoNE, 2007) and validated the instrument for use in middle schools. Hunuk, Ince and Tannehill (2012) conducted empirical research with PE teachers and their middle school students using this tool; findings suggested that both groups improved HRFK test scores within six weeks of intervention. Another study by Cengiz and Ince (2014) in a rural middle school context revealed that the HRFK of students was improved with a 12-week social-ecologic experimental design. Improving school content in this rural area was effective in developing the health-related knowledge and behaviours of students. In a study by Tek (2015), the levels of both physical fitness and physical fitness knowledge among middle school students were compared. According to the findings, the HRFK levels of students were generally at the “pass” or “average” level. When Ince and Hunuk (2013) explored the subject from physical education teachers’ perspectives, they found HRFK levels to be substantially insufficient (Castelli & Williams, 2007), with significant differences in knowledge levels and knowledge internalization processes among participating teachers. In addition, they pointed out that teachers were not successful in creating a physical education learning environment conducive to HRFK.

Research shows that HRFK can be effective in improving physical activity behaviour. The fact that studies conducted on this subject within Turkey are limited, and that students are not sufficiently informed with regard to HRFK, constitute the reason for this research. In the current study, middle school students’ HRFK levels were examined with reference to the variables of school type, gender, and grade level. The study has been designed to provide information about the HRFK level of Turkish middle school students and their needs. The hypothesis is that middle school students’ health-related fitness knowledge is low.

Methods

Participants

The study sample was selected from private and public middle schools in Canakkale, Turkey. Students were between 11 and 14 years old ($n=720$) and attended one of three private schools (Canakkale College, Ismail Kaymak College or Gokkusagi College ($n_{\text{female}}=187$; $n_{\text{male}}=199$)) or one of four state schools (Kepez Huseyin Akif Terzioğlu, Anafartalar, Turgut Reis and Istiklal ($n_{\text{female}}=154$; $n_{\text{male}}=180$)). Participants’ weight, height and body mass index (BMI) are recorded by gender in Table 1.

Data Collection Instruments

Health-Related Fitness Knowledge (HRFK) was tested using the translated version of the Super Kids-Superfit questionnaire (Mott et al., 1991). The Turkish version of this questionnaire was adapted according to the Turkish physical education curriculum for middle school HRFK standards (MoNE, 2007) and validated by Hunuk and Ince (2010). The Turkish version includes 36 items. According to the validation

TABLE 1 Middle school students' descriptive statistics for height, weight and BMI

Grade	Variables	Public School				Private School			
		Female		Male		Female		Male	
		n	M±SD	n	M±SD	n	M±SD	n	M±SD
5	Height (cm)		1.45±0.07		1.48±0.08		1.47±0.08		1.51±0.10
	Weight (kg)	23	38.52±8.49	27	40.74±6.43	58	42.24±7.75	40	45.60±11.46
	BMI (kg/m ²)		18.16±2.64		18.57±2.53		19.44±3.27		19.70±3.05
6	Height (cm)		1.51±0.08		1.54±0.10		1.55±0.06		1.54±0.07
	Weight (kg)	41	41.68±7.59	52	44.90±9.18	39	49.28±10.68	56	48.25±10.68
	BMI (kg/m ²)		18.01±2.83		18.65±2.29		20.22±4.13		20.03±3.35
7	Height (cm)		1.56±0.08		1.59±0.09		1.60±0.07		1.62±0.09
	Weight (kg)	44	48.27±7.69	50	51.20±10.28	50	51.96±12.03	57	54.45±11.06
	BMI (kg/m ²)		19.73±2.32		20.08±3.12		19.96±4.05		20.48±2.88
8	Height (cm)		1.62±0.05		1.63±0.11		1.64±0.08		1.64±0.05
	Weight (kg)	46	51.39±7.39	51	57.45±13.38	40	53.95±7.70	46	56.71±6.81
	BMI (kg/m ²)		19.44±2.14		21.42±3.51		19.91±2.35		21.06±2.45

study, the item difficulty values ranges from 0.24 to 0.90, the average p-value of the test is 0.60, and the discrimination value range is 0.04–0.54. The reliability value of the test is 0.68. Based on these findings, the test is reported as a valid measure of Turkish middle school students' conceptual HRFK by Hunuk and Ince (2010).

Data Collection Procedure

Data was collected between late February and mid-May 2013. All questionnaires were administered during school hours by the physical education researcher either during the lunch break or after school. The questionnaire was explained by the researcher to the participants. Permission was granted by school administrators, principals, physical education teachers and Canakkale District National Education for ethical concerns. Informed written consent for participation and debriefing was also obtained from both students and their parents prior to the study.

Statistical Analysis

Descriptive statistics (frequencies and percentages) and non-parametric tests were used (the Mann-Whitney U-test and Kruskal-Wallis H-test) to organize data according to the variables of school type, gender, and grade. In addition, the Pearson chi-square analysis was used to correlate school type and HRFK test success ($p < 0.05$). All statistical analysis was performed after checking normality assumptions (the Kolmogorov-Smirnov and Shapiro-Wilk tests), using the Statistical Package for Social Science (SPSS) for Windows. HRFK test scores were standardized on a 100-point scale according to the Ministry of National Education's subject grading system. Students' scores were rated as (5) very good (85–100), (4) good (70–84), (3) average (55–69), (2) pass (45–54), (1) fail (0–44).

Results

Among public middle school students, 46.1% ($n=154$) of participants in the study were female and 53.9% ($n=180$) were male. Among private school participants, 48.4% ($n=187$) were female and 51.6% ($n=199$) were male.

TABLE 2 Middle school students' correct answers with standardized scores and descriptive statistics in the HRFK test according to school type, grade, and gender

Grade	Variable	Public School				Private School			
		Female		Male		Female		Male	
		n	M±SD	n	M±SD	n	M±SD	n	M±SD
5	Correct Answer	23	18.73±3.95	27	19.11±4.73	58	23.89±3.38	40	21.02±5.03
			55.21±11.87		56.37±14.11		70.39±9.83		61.90±14.75
6	Correct Answer	41	20.87±3.72	52	20.46±4.72	39	25.28±3.38	56	23.82±4.69
			61.46±10.92		60.25±13.97		74.35±11.12		70.05±13.69
7	Correct Answer	44	20.90±4.32	50	20.18±5.02	50	25.02±3.91	57	25.12±4.31
			61.54±12.70		59.34±14.81		73.60±11.33		73.82±12.55
8	Correct Answer	46	22.95±4.39	51	22.76±4.38	40	26.37±4.16	46	25.54±4.04
			67.60±12.86		66.98±12.84		77.47±12.12		75.08±11.75

The mean, standard deviation (SD) and percentage of the students' HRFK test scores and standardized test scores were calculated and arranged according to school type, gender, and grade in Table 3. The results according to grade indicated that HRFK test scores increased by year except for the case of 7th-grade public school males (20.18±5.02; 59.34±14.81) and 7th-grade private school females (25.02±3.91; 73.60±11.33). In addition, private school students had higher HRFK test scores and higher standardized test scores for both genders and all grades than their public school counterparts.

TABLE 3 Middle school students' descriptive statistics in HRFK test components

Variable	Number of Questions	Public School (n=334)	Private School (n=386)
		M±SD	M±SD
Cardiovascular Endurance	10	6.07±1.94	7.39±1.52
Muscle Strength Endurance	4	2.37±0.89	2.77±0.84
Flexibility	4	2.12±0.97	2.53±1.00
Body Composition	3	1.49±0.89	1.72±0.81
Training Principles	6	3.57±1.33	4.16±1.36
General Health Knowledge	9	5.34±1.50	6.00±1.61

The findings indicated that for the HRFK components of cardiovascular endurance, muscle strength endurance, flexibility, body composition, training principles and general health knowledge, private school students scored higher than public school students did.

When the middle school students' correct answers and standardized scores from the HRFK were arranged by school type and gender, public school students (n=334) were shown to have lower scores (20.99±4.61) and standardized scores (61.81±13.59) than private school students' (n=386) scores (24.50±4.38; 72.08±12.76). In terms of gender, female students (n=341) had more correct answers (28±4.50) and higher standardized scores (68.53±13.15) than male students' (n=379) scores (22.51±5.06; 66.22±14.84).

Middle school students in private schools were more successful at all grade levels than their public school counterparts were. Higher percentages were evident among private middle school students (see Table 5).

The degree of correlation between test scores by school type was examined with the Pearson chi-square test. The analysis showed a significant difference [χ^2 (4, n=720)=100,36, p=.0001] in HRFK test scores by school type.

According to the Mann-Whitney U-test results, there was a significant difference in HRFK test scores by school type (z=-10.139, p<.05) but no significant difference according to gender (z=-1.521, p>.05).

Participants' HRFK test scores were examined by grade using the Kruskal-Wallis H-test, and a significant difference was observed between classes [χ^2 (3)=32.131, p=.000]. The Mann-Whitney U-test was also used to examine differences by grade. A significant difference was detected between grades 5-6 (z=-2.184, p<.05), 5-7 (z=-2.853, p<.05), 5-8 (z=-5.602, p<.05), 6-8 (z=-3.731, p<.05) and 7-8 (z=-2.695, p<.05). However, no significant difference was detected between grades 6-7 (z=-0.941, p>.05) (see Table 6).

Discussion

In this study, public and private middle school students' HRFK levels were examined by gender, class level and school type. According to the research findings, HRFK levels varied by school type, with private school students scoring higher than public school students. HRFK levels also differed significantly by grade level but not by gender.

TABLE 4 Middle school students' HRFK degree of test scores (MoNE) descriptive statistics based on school type

School Type	Degree of Test Scores					Total
	Fail	Pass	Average	Good	Very Good	
Public School	46	52	129	95	12	334
	13.8%	15.6%	38.6%	28.4%	3.6%	100.0%
Private School	6.4%	7.2%	17.9%	13.2%	1.7%	46.4%
	12	18	104	194	58	386
Private School	3.1%	4.7%	26.9%	50.3%	15.0%	100.0%
	1.7%	2.5%	14.4%	26.9%	8.1%	53.6%
Total	58	70	233	289	70	720
	8.1%	9.7%	32.4%	40.1%	9.7%	100.0%
	8.1%	9.7%	32.4%	40.1%	9.7%	100.0%

Dilorenzo and colleagues (1998) suggested that HRFK was one of the variables that determined exercise behaviours among middle school students. However, limited research has been conducted on this topic. PE teachers play a major role in conveying HRFK. Studies suggest that more than half of middle school students were unable to identify physical fitness activities and parameters, and some students also could not meet the physical fitness parameters of the Fitnessgram test (Kulinna, 2004; Meredith & Welk, 2004; Stewart & Mitchel, 2003).

TABLE 5 Middle school students' HRFK test scores analysis with Mann-Whitney U test based on school type and gender

	Variable	n	M±SS	z	p
School Type	Public School	334	61.81±13.59	-10.139	.000*
	Private School	386	72.08±12.76		
Gender	Female	341	68.53±13.15	-1.521	.128
	Male	379	66.22±14.84		

Legend: *Significant level, $p < 0.05$.

In our study, when middle school students' HRFK levels are assessed by grade using the Ministry of National Education assessment tools and success parameters, public school students scored at the intermediate level. Private school students scored at the advanced level. Tek (2015) found that public middle school students scored at the passing level, while students in higher grades scored at the intermediate level. Research outcomes for urban and rural public schools have usually been found to be similar in the Turkish context (Cengiz & Ince, 2014; Hünük, Ince & Tannehill, 2012).

TABLE 6 Middle school students' HRFK test scores and analysis with Mann-Whitney U-test based on class

Grades	n	M±SD	z	p
5-6	148	63.18±13,81	-2.184	.029*
	188	66.36±13,86		
5-7	148	63.18±13,81	-2.853	.004*
	201	67.47±14,46		
5-8	148	63.18±13.81	-5.602	.000*
	183	71.46±13.13		
6-7	188	66.36±13.86	-.941	.347
	201	67.47±14.46		
6-8	188	66.36±13.86	-3.731	.000*
	183	71.46±13.13		
7-8	201	67.47±14.46	-2.695	.007*
	183	71.46±13.13		

Legend: *Significant level, $p < 0.05$.

In their empirical research conducted on PE teachers, Hunuk et al. (2012) suggest that training to improve the HRFK level in teachers allows knowledge development and that this change reflects on students. These findings show how important PE teachers are in conveying program accomplishments. The present study suggests private school students' higher HRFK might be related to PE teachers, school environment, and facilities. It is recommended that this subject also be explored using qualitative research methods. Based on the findings obtained in our research, private middle school students' HRFK success is higher than that of public middle school students. It is observed that the HRFK level of urban and rural public school students has increased as a result of changes in educational opportunity and the learning environment (Cengiz & Ince, 2014; Hunuk, Ince & Tannehill, 2012) and that they scored higher than private school students did.

Based on the available literature, it is seen that the number of studies exploring middle school students' HRFK level by gender and grade level is limited. In his research comparing middle school students' Physical Fitness Level (PFL) and HRFK, Tek (2015) suggests that students' HRFK levels do not differ by gender. These results are similar to those obtained from our study, which suggests that gender is not an important factor in middle school students' HRFK levels. In their research conducted at the high school level, Keating, Chen, Guan, Harrison, and Dauenhauer (2009a) surveyed secondary school students' HRFK and found that female students had higher scores than males did in the standardized HRFK test. The study also examined high school students' perceptions of issues relating to PE knowledge and health education; the findings revealed that students possessed a high level of awareness regarding the importance of PE to well-being. It was also reported that male students' views on participating in the exercise were more positive than those of female students (Al-Amari & Ziab, 2012). The results of the present study show that gender might have an impact on HRFK level, as might age.

The findings obtained in this study indicate that there were differences in HRFK between middle school students by grade. Tek (2015) reported in his research that the average number of correct answers among 8th graders was higher than those of students in other grades. He also reported that 5th-grade male students had the lowest average correct answers. Based on the findings of our research, the average HRFK scores of public and private school students improved by grade, except in the case of 7th-grade students. A decrease in average score was observed among 7th-grade public school males and 7th-grade private school females. It is recommended that 7th grade PE lessons be configured to improve HRFK levels. It should be noted that PE teachers, the quality of actual PE lessons, the number of hours spent in physical education (available as elective courses in middle schools), environmental factors and supplemental lessons might have an impact on the differences observed in middle school students' HRFK levels by grade. In a different study, the healthy living behaviours of 5th to 7th-grade students were examined, and significant differences in exercise behaviours were identified between grades; it was concluded that the healthy living scores of 5th and 6th-grade students were higher and statistically more significant than those of 7th-grade students (Hunuk, Gursel & Ince, 2007). In a qualitative study, Placek et al. (2001) suggested that exercise behaviours could be improved with HRFK. Moreover, it was indicated that middle school students had faulty knowledge about physical fitness and that they associated physical fitness with being very skinny. Findings of other research also reported similar results (Timothy et al., 2011; Kulinna, 2004; Stewart & Mitchel, 2003).

It is useful to note the limitations of the study when commenting on the results. The survey method used as a means of data collection is limited to the answers of the middle school students participating in the survey. A random sampling procedure with a large number of participants can be applied in future research for the purposes of generalization. Furthermore, the research findings were limited to those of Canakkale middle school students.

Conclusion

In conclusion, the research findings have shown that private middle school students' HRFK level was higher than that of public school students. Gender was not found to be influential on HRFK levels, but grade level was. Physical Education lessons should be planned with the goal of improving students' HRFK levels. To achieve this, professional development programs should be organized that are aimed at improving the knowledge levels and educational techniques of PE teachers (Hunuk, Ince, & Tannehill, 2012). In this way, program objectives will be achieved more easily through conceiving a more effective middle school PE training curriculum, as recently developed in accordance with a structured training approach. It is also recommended that HRFK tests that account for differences in grade level be developed for future studies. Moreover, an examination of pre-service PE teachers' HRFK levels during undergraduate education and how they utilize their knowledge might be presented as a general suggestion of this research.

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