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Health-Related Fitness Monitoring Practices in Secondary School-Based Physical Education Programs

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24 Abstract

25 Purpose: To examine the prevalence of and approaches to monitoring health-related physical fitness (HRPF) in secondary school-based physical education programmes.

27 Methods: Physical education teachers (N =327; 56.6% female) from 235 secondary schools (33.1% of national total) in the Republic of Ireland completed a survey designed specifically for the purposes of this study.

30 Results: HRPF tests were used by 95.3% of teachers. A significant decline in testing frequency was observed from junior grades (13-15 years) to senior grades (16 to 18 years) (p < 0.001). Just over half (51.7%) of teachers discarded test results after a single use. Less than one third of teachers indicated that they shared test results with students’ parents. The vast majority (87.0%) of teachers agreed that the development of a digital platform would facilitate monitoring test results over time.

35 Conclusion: HRPF testing is highly prevalent in secondary schools. More actions are needed to ensure teachers use pedagogically sound student-centred approaches towards monitoring HRPF, with a focus on learning that may lead to more positive testing experiences for students. Consideration should be given to the development of digital platforms to facilitate monitoring and reporting HRPF.

39 Key Words: fitness testing; monitoring; health; physical education; schools.
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Introduction

The role of school-based physical education programmes in monitoring and promoting health has been extensively debated in recent years (Alfrey & Gard, 2014; Cale, Harris, & Chen, 2014; Silverman, Keating, & Phillips, 2008). The unique position of physical education as one of the primary vehicles to promote the importance of health and activity among young people (Pate et al., 2006) has been increasingly acknowledged by national (Department of Health, 2016) and international (Hallal et al., 2012) policy makers. Fitness testing has been part of school-based physical education programmes for over half a century (Morrow, Zhu, Franks, Meredith, & Spain, 2009), and has been reported as the most common form of assessment used in physical education in the state of California, United States (US) (Ferguson, Keating, Bridges, Guan, & Li, 2007). Despite the prominence of fitness testing in physical education programmes internationally (UNESCO, 2014), calls for more extensive examinations of teachers’ use of fitness tests in school-based physical education programmes have mostly gone unanswered (Mercier, Phillips, & Silverman, 2016). Therefore, little is known about teachers’ approaches to fitness testing in schools (Cale et al., 2014), particularly in countries where a standardised approach to HRPF monitoring does not exist.

Physical fitness is a complex and multi-faceted construct that includes performance related components and health-related components (Welk, Corbin, & Dale, 2000). In recent years, there has been a shift away from monitoring performance related components of fitness to health-related components (Pillsbury, Oria, & Pate, 2013). Health-related components of fitness, including cardiorespiratory endurance (CRE), musculoskeletal fitness (muscular strength, endurance and power) and body composition, have been identified as powerful markers of future health among children and adolescents (Ortega, Ruiz, Castillo, & Sjöström, 2008; Smith et al., 2014). Perhaps more importantly, positive changes to HRPF during adolescence can reduce the risk of negative health outcomes later in life (Ortega, Silventoinen, Tynelius, & Rasmussen, 2012). In addition, high levels of HRPF have been associated with higher academic achievement (Bezold et al., 2014). HRPF is often assessed in the form...
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of a fitness test battery in schools (Bianco et al., 2015). A fitness test battery is a group of two or more tests that measure one or more components of fitness. Some countries have developed test batteries in an effort to establish a standardised approach to fitness testing. International examples include Fitnessgram® (United States), CNPFT (China), ALPHA (European Union), GTO (Russia), SLOfit® (Slovenia), Netfit® (Hungary) and Move! (Finland). Indeed, several states in the US, and countries including Japan, China, Slovenia Hungary and Finland have mandated monitoring physical fitness in school physical education programmes (Csányi et al., 2015; Salin & Huhtiniemi, 2018; Shephard, 2018).

More recently, assessments of physical literacy, including the Canadian Assessment of Physical Literacy, include HRPF as a key component (Francis et al., 2016).

Despite its long history, the purpose of fitness testing in physical education remains a divisive topic (Lloyd, Colley, & Tremblay, 2010). Proponents pointed out the proposed educational and health benefits of HRPF monitoring (Csányi et al., 2015). Mahar and Rowe (2008) noted fitness tests can be used to provide individualised feedback to students about their fitness levels, promote goal setting and educate students about physical activity and fitness. Silverman and colleagues (2008) are of the view that, as with reading and mathematics instruction, it is important for students to monitor and improve their fitness test results. Many experts have also highlighted the importance of students being taught to self-assess their own fitness levels (Castelli, Hillman, Buck, & Erwin, 2007; Mercier & Silverman, 2014a). In a systematic review on the reliability of field based fitness test batteries in youth, Artero et al. (2011) concluded that field based testing was reliable in school settings and suggested schools presented a viable alternative to monitoring key markers of health in population based studies. In contrast, many scholars have questioned the ‘privileged position’ of fitness testing in physical education (Alfrey & Gard, 2017). Cale and Harris (2009) suggested HRPF testing may well represent a misdirected effort in health promotion due to the lack of evidence supporting its role in promoting physical activity. In addition, it has been posited that fitness testing could be adding to the performative culture that many argue has enveloped education systems in recent years (Alfrey & Gard, 2017). Wrench and Garrett (2008) have equally noted concerns over the unproblematic use of the...
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fitness testing, in that teachers do not question its role and incorporate it as a standalone component of a physical education programme. Naughton, Carlson and Greene (2006) proposed that a more appropriate context for fitness testing may lie in a sport specific setting rather than school-based setting. Despite reservations regarding current implementation practices, Cale and colleagues (2014) concluded that, if integrated appropriately, there was no reason why fitness testing could not play a role in supporting healthy lifestyles and in educating young people about physical activity and fitness.

Over the past two decades, a wealth of research on pedagogically sound approaches to integrating fitness testing in school-based physical education programmes has been published (Cale, Harris, & Chen, 2007; Corbin et al., 2014; Liu, 2008), within which recommendations included: moving away from command-style test administration, to a more reciprocal, peer assessment approach (Graser, Sampson, Pennington, & Prusak, 2011); using criterion rather than norm referenced health standards to promote self-referenced comparison with attainable health standards (Mahar & Rowe, 2008); and allowing students an opportunity to familiarise themselves with tests prior to testing (Morrow & Ede, 2009). In addition, it was advised that fitness testing should not be conducted in isolation, but included as part of a broader fitness education unit of learning (Wiersma & Sherman, 2008). Although students are the primary focus when administering a HRPF test battery, it is teachers who determine whether fitness tests should be used, and how they are implemented (Silverman et al., 2008). A study by Mercier and Silverman (2014a) found that teachers are a significant factor in shaping students’ attitudes towards fitness testing, and indeed gaining teachers’ perspectives has become increasingly important for understanding pedagogical processes (Alfrey & Gard, 2014). There thus has been, and continues to be, healthy debate on the place and purpose of fitness testing in school-based physical education programmes. However, there remains a dearth of empirical evidence on approaches to monitoring HRPF in secondary school settings. Considering the aforementioned gaps in the current evidence-base, the aim of this study was to examine HRPF monitoring practices in secondary school-based physical education programmes amongst a nationally representative sample of teachers in the Republic of Ireland.
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Methods

Survey Development

A survey designed specifically for the purposes of this study was developed. Survey items were also generated in part from the ‘Teachers Uses of Fitness Tests’ survey developed by Keating and Silverman (2004), and a ‘Health, Activity and Fitness Monitoring’ survey administered by Cale, Harris and Chen (2007). The initial survey was categorised into three themes: HRPF Monitoring practices; Components and tests used; and Barriers to fitness testing. Three response formats were utilised. (i) Closed-ended responses were used to obtain specific categories of response (ii) Open-ended questions were used where additional detail was required to explain a specific response and (iii) A seven point Likert scale ranging from one (strongly disagree) to seven (strongly agree) was used for questions in relation to barriers to fitness testing (Keating & Silverman, 2004). In an effort to establish greater content validity, a review of the draft survey involving five experts in sport pedagogy was conducted. The experts were selected based on their knowledge and expertise in the area of health-related fitness and physical education. The lead author reviewed the survey with each expert individually. Using a five-point rating scale, the team of experts were asked to evaluate the relevance of the items in each theme (five = very relevant, one = not relevant). The expert review team were given the opportunity to record comments for each individual item and suggest new items or themes. Experts were also asked to comment on the relevance of each theme. Using the thresholds as set out by Zhang and Chen (2017), it was determined that an item with a mean rating score below 3.0 and/or with substantial revision suggestions should not be accepted. The expert review panel provided specific recommendations regarding the inclusion of two additional themes, these being test frequency and an open-ended question on the purpose of HRPF testing in physical education. A revised draft survey was circulated to the expert reviewers and all were satisfied with the revisions made and no additional comments were recorded.
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The final amended survey comprised of five themes. 1) **Frequency of test use:** This section sought to gather information regarding the time of year and frequency of HRPF testing. 2) **Monitoring practices:** Teachers were asked about the methods they used to record test scores and provide feedback on results. 3) **Components and tests:** This section contained questions in relation to the components HRPF assessed and the tests used to assess these components. 4) **Barriers to HRPF:** Barriers to the implementation of HRPF tests were addressed, including gender differences, school facilities and equipment. 5) **HRPF testing in the physical education curriculum:** Finally, teachers were asked to provide a brief statement on whether or not fitness testing should be part of a physical education curriculum. To examine the internal consistency among the questionnaire items, a convenience sample of practising physical education teachers (n = 39; female = 24; male = 15) were involved in a pilot of the questionnaire. Two approaches were used to examine internal consistency. Firstly, frequency counts of responses for similar ‘Yes’/‘No’ questions were reviewed and found to be consistent (Fowler, 1995). In addition, correlations of responses between related and unrelated questions were computed for both the pilot and finalised survey. Low correlations were found between items that should not be strongly correlated. For example, the following two statements were not strongly correlated: “I find administering a fitness test lesson more challenging than a standard physical education lesson,” and “A HRPF test lesson is easy to deliver”, \( r(327) = .24, p < 0.01 \).

Moderate to high correlations were confirmed between items that should be related. For example, “I have the required knowledge to deliver a HRPF testing lesson”, and “My pre-service teacher education provided me with adequate knowledge to conduct HRPF fitness tests”, \( r(327) = .608, p < 0.01 \). Teachers were given the opportunity to note any questions that were unclear and make recommendations on how the survey could be improved. All participants agreed that the survey was clear and no additional comments were recorded.

**Procedure**

The current study utilized a cross-sectional survey design. For convenience and wide distribution, an online questionnaire was distributed via SurveyMonkey (SurveyMonkey, CA, US).
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Cloud-based software. The Republic of Ireland education system is made up of three levels: primary (ages five to 12), post-primary or secondary (ages 13 to 18), and third level (i.e. Universities, Institutes of Technology). Specialist physical education teachers are only required at post-primary level which comprises of junior cycle (age 13 to 15), a transition year (age 16) and senior cycle (age 17 to 18). In May 2017, 711 post-primary schools were registered in the Republic of Ireland on the Department of Education and Skills’ online database. An introductory email marked for the attention of the school’s physical education department was sent to the email address of all registered post-primary schools. The email outlined the purpose and objectives of the survey, as well as details regarding the time commitment and confidentiality of all collected information. The email also provided a web link to access the survey. Informed consent was indicated by subsequent completion of the survey. Participants were informed that they may exit the survey at any time without implication. The timeframe for participation was set at five weeks, coinciding with the end of the school term in May 2017. To minimise non-response bias, a re-invitation to complete the survey was circulated after two, four and five weeks. A unique school identifier code was used to track responses and target initial non-responders for the re-invitation process. After five weeks, all complete responses were downloaded from the SurveyMonkey platform and collated for statistical analysis.

**Participants**

Ethics committee approval for this study was granted by the Research Ethics Committee of the Faculty of Education and Health Sciences, University of Limerick. Study protocols were approved by the lead author’s institute review board. Most physical education departments in Republic of Ireland schools contain more than one physical education teacher. Therefore, the project team agreed that all physical education teachers within each school could participate, as variations in programme design can exist within individual departments. A two year recall period was set for the questionnaire, as recommended by Keating and Silverman (2004). All elements of the questionnaire required an answer to minimise missing values. However, skip logic was used for some responses which accounts for the reduction in response numbers in some themes. For example, teachers who indicated that 8...
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they did not use fitness tests were not required to complete questions in relation to HRPF monitoring practices.

Statistical Analysis

Complete responses \((N = 327)\) were extracted from SurveyMonkey and converted for use in the Statistical Package for Social Sciences (SPSS version 24, Chicago IL) for analysis. The research team defined an incomplete response as having completed less than 80% of the overall survey or missing two or more items from an individual section. Incomplete responses \((n = 34)\) were excluded from all analyses. The survey contained mostly closed-ended questions. Therefore, responses were analysed descriptively which involved calculating and reporting percentages and frequencies. Means (\(M\)) and standard deviations (\(\pm\)) were calculated for data in section five, Barriers to fitness testing. Chi-square tests were used to assess differences among categorical variables. To check the normality of the scale scores, descriptive statistics, kurtosis, and skew were calculated. Mean, median, and mode were all approximated, and kurtosis and skew suggested normality was acceptable (George, 2011). A z-test showed no significant differences between the components of HRPF assessed between year four (Transition year) and senior cycle (years five and six). Therefore, there was sufficient grounds to use the combined dataset of junior cycle (years one to three) and senior cycle (year four to six) when analysing differences in components assessed across year groups. The relationship between specific variables (e.g. teachers who track students’ results across school years and those who use computers to store results) were investigated using Pearson product-moment correlation coefficient. Responses to the only open-ended question regarding teachers’ views on whether or not HRPF testing should be part of the physical education curriculum were reviewed and organised thematically in line with the guidelines as set out by Renner and Taylor-Powell (2003). This involved identifying themes and patterns from the responses. Once the key themes had been established and agreed upon by all members of the research team, responses were arranged into coherent categories and frequencies of responses within each category were calculated.
Results

Demographics

The demographic profile of participants is provided in Table 1. Physical education teachers (N = 327; 56.6% female) from 235 secondary schools (33.1% of national total) completed the survey. Responses by teachers in single and mixed sex schools (14.4% boys; 20.5% girls; 65.1% mixed) were shown to be representative of the national sample (14.2% boys; 18.5% girls; 67.3% mixed). There was an over representation of private fee-paying schools (9.8% survey; 7.1% national). However, a Chi-square test of independence indicated this did not have a significant effect on any of the key outcome variables (p ≥ 0.22). The regional spread of participants was consistent with state demographics (CSO, 2016). Participants’ teaching experience ranged from one to 38 years (M = 12.8 ± 9.2).

Frequency of test use

The vast majority of the 327 respondents (95.3%) indicated that they used HRPF testing in their physical education programmes. Almost one third (29.9%) used HRPF tests with each class group on one occasion, 53.0% assessed twice and 12.4% of teachers assessed HRPF on three or more occasions per academic year. A Pearson product-moment correlation coefficient indicated no significant association between test frequency and (i) teacher gender (r = .06, p = 0.48), (ii) school type (boys, girls, mixed; r = .04, p = 0.73) (iii) or years’ teaching experience (r = .09, p = 0.12). A Chi-Square test of independence revealed a significant decline in monitoring frequencies from junior cycle (year one to three, ages 13 to 15) to senior cycle (year four to six, ages 16 to 18), X² (1, n = 327) = 137.20, p < 0.001. The frequency of testing from year one to year six was not linear, with teachers of years two (ages 13 to 14) (96.6%) and three (ages 14 to 15) (97.2%) reporting highest frequencies of using HRPF tests.
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Monitoring practices

Just over three quarters of teachers (78%) indicated that they kept a record of their students’ results. However, only 11.9% of teachers monitored students’ HRPF test scores from years one (13 years) to year six (18 years). Over half (51.7%) of teachers discarded test results after a single use. In addition, 27.7% (n = 91) indicated that they tracked students’ results on a yearly basis but not across year groups. Hardcopy folders were the most commonly used method to store test results (69.2%). Computers or cloud-based software were used to store results by 17.8% of teachers. A weak but significant correlation was observed between teachers who tracked students’ results from year to year and those who used a computer to store results (r = .269, p< 0.001). A total of 85.9% of teachers indicated that they provided feedback to students on their results. However, only 33% of teachers provided such feedback to students’ parents. The vast majority of teachers (87.2%) indicated that physical health was not monitored in school outside of physical education.

Components and tests used

Figure 1 and Figure 2 provide a breakdown of the components assessed in each year group and the tests used to assess these components. Cardiorespiratory endurance was the most commonly assessed component with an average of 71.2% teachers assessing it in all six year groups. Body composition was assessed least frequently, on average by 6.8% of teachers across all year groups. The PACER test (20m Shuttle Run Test) was the most frequently employed test, used by 78.9% of teachers, followed by the sit and reach test (60.7%).

Insert Figure 1. A breakdown of the HRPF components assessed in each school year group (grade).

Insert Figure 2. Field tests used by physical education teachers to measure HRPF (categorised by component).
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265 **Barriers to Fitness Testing**

A chi-square test of independence revealed a significant difference between boys’ and girls’ reactions to fitness tests from their teachers’ perspective, $X^2 (1, n = 481) = 58.09, p < 0.001$. A total of 65% of teachers indicated that boys respond positively, however, only 37% of teachers indicated that girls respond positively to fitness tests. With regard to school facilities, although 63.9% of teachers agreed or strongly agreed that their school had adequate physical education facilities, 69.4% of teachers indicated that they were required to share a sports hall on at least one occasion per week with another physical education class group. However, despite having to occasionally share PE facilities, teachers somewhat disagreed (M=3.3 ± 1.8) that administering a HRPF test lesson was more challenging than a standard PE lesson. In terms of the selection of HRPF test measures, teachers indicated that they would be in favour of having a standardised test battery for monitoring HRPF in schools (M=6.2 ± 1.2). Teachers were also strongly in favour of having access to a digital platform that would facilitate tracking student scores and reporting results (M=6.4 ± .94).

278 **Reasons for fitness testing**

Participants were asked to provide a brief statement as to why HRPF testing should or should not be part of a physical education programme. Of those who responded (n = 274), 252 (92.0%) were in support of its inclusion, while 22 teachers (8.0%) cautioned against the use of HRPF testing. No statistically significant differences were observed between male and female teachers’ responses. The educational benefits and student learning were the most commonly cited reasons for the inclusion of HRPF testing (17.3%, n = 48). One teacher stated, “Fitness testing is an educational tool and not an end in itself. Testing is used to give students an understanding of how components can be tested and to assist them in compiling their PA profile” (female teacher, mixed sex school). The importance of informing students of areas of strength and weakness across all the components of HRPF was the second most cited reason for its inclusion (13.4%, n = 37). For example, one teacher suggested it gives “students the opportunity for self-evaluation in relation to different aspects of health-related fitness”
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(male teacher, single sex girls’ school). Many teachers cited the importance of HRPF in promoting physical health (12.3%, \( n = 34 \)). One teacher described it as “essential for informing students about their physical health” (female teacher, single sex girls’ school). Teachers (\( n = 18 \)) also noted the opportunity to compare students’ results against normative values, “it is great to see where a student is amongst their age range” (male teacher, mixed-sex school). Of the teachers who cautioned against the inclusion of HRPF testing (\( n = 22 \)), many felt that it was the students who were least active, who benefitted least. One participant argued that, “those students who achieve a good result are motivated to improve, but I find that those who perform poorly are embarrassed and display a negative attitude to testing” (male teacher; mixed-sex school).
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Discussion

To date, examinations of HRPF monitoring practices in secondary schools have been generated from relatively small sample sizes that have not been representative at a national level (Cale et al., 2014; Keating & Silverman, 2004). This survey, shown to be representative of a national sample and consistent with state demographics, is the first comprehensive review of HRPF monitoring practices to take place in the Republic of Ireland. The following discussions reflect on some of the key findings to emerge from the study.

Prevalence of HRPF testing

HRPF testing was a highly prevalent component of physical education programmes in secondary schools in the Republic of Ireland and was used by over 95% of teachers. This concurs with previous studies that have reported testing to be commonplace in school-based physical education programmes. Cale et al. (2014) reported rates of 89% in the UK, while Keating and Silverman (2004) reported slightly lower rates of 83% in the US. Concerns have been expressed over HRPF testing often constituting an entire fitness education programme (Alfrey & Gard, 2014). However, frequency rates reported in this study indicate that most teachers assessed HRPF on two occasions or less per academic year. Significant variations in the prominence of HRPF testing between junior cycle (year one to year three) and senior cycle (year four to six) were observed. HRPF testing was far more prominent during students’ first three years of secondary education. There are several possible explanations for this, the most likely being the state leaving certificate examination which takes place in the final year of secondary education, leading to a subsequent reduction in the time allocated to physical education. Previous research at a national level by MacPhail et al. (2005) has highlighted the impact of the state leaving certificate examination on the time allocation for physical education, particularly during students’ final two years. They found that 88% of school principals were in support of physical education as a compulsory subject at junior cycle (ages 13 to 15), however, only 53% supported compulsory physical education at senior cycle (ages 16 to 18).
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**Monitoring practices**

A logical reason for HRPF testing is to monitor students’ results over time. Yet, over half (51.7%) of teachers discarded test results after a single use, while less than 12% indicated that they tracked students results from year to year. There is a paucity of research internationally on HRPF monitoring trends in schools. Leading health experts have called for the development of efficient systems for large-scale monitoring of HRPF data, and the transfer of this data to centrally located databases (Ruiz et al., 2006). Examples of such systems operated through school-based physical education programmes include SLOfit® in Slovenia, Netfit® in Hungary, and Fitnessgram® in the US.

Participants in this study indicated that they were strongly in favour of developing a web-based solution to facilitate monitoring HRPF. However, some scholars have expressed concern at the unprecedented levels of surveillance of young people (Webb & Quennerstedt, 2010), suggesting it may be contributing to the performative culture that has dominated education discourse in recent times (Cale et al., 2014). Despite these concerns, we share the views expressed by Csányi and colleagues (2015) that HRPF monitoring should have a place in physical education programmes both from an educational and public health viewpoint. As noted previously, HRPF in children and adolescents has been proven to be a powerful predictor of health in later life (Ortega et al., 2008) and physical education teachers are in a unique position to administer HRPF test batteries as a mechanism to educate students on the role of HRPF in leading a healthy lifestyle.

This investigation revealed many positive uses of HRPF tests in secondary school-based physical education programmes. These included, educating students on the importance of health and fitness, and providing a platform for students to self-evaluate their HRPF in the form of personal activity profiles. However, one of the more interesting findings was that less than one third of teachers shared test results with students’ parents. A recent study by Mercier, Phillips and Silverman (2016) revealed similar trends, with less than 30% of teachers indicating that they send students’ results home. Communication between parents and teachers is a fundamental aspect of the education process (Jeynes, 2007). Most of the existing HRPF web-based monitoring platforms, including 15
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Fitnessgram®, SLOfit® and MOVE!, include an option that allows parents to view their child’s results. However, sharing HRPF results alone might be of little value in trying to promote engagement in physical activity. Such platforms for communicating HRPF results could also inform parents of their child’s physical activity levels and the current physical activity for health guidelines, in addition to the physical activity opportunities available in schools and local communities. Cale and colleagues (2014) recommend complementing HRPF monitoring with physical activity monitoring via the use of simple questionnaires, activity diaries and pedometers which perhaps represents a more holistic approach to monitoring.

**Components assessed and tests used**

Given that there is no standardised approach or recommended test battery for monitoring HRPF in the Republic of Ireland, a key aspect of this survey was to examine the components of HRPF assessed and the fitness tests used. Cardiorespiratory endurance was the most commonly assessed component of HRPF in all year groups, almost twice as commonly assessed as any other component (see Figure 1). The prominence of some components at the expense of others, including musculoskeletal fitness and flexibility, is a finding of potential concern. There is evidence to indicate that each HRPF component is independent, and we cannot compensate for a deficit in one component by excelling in another (Plowman et al., 2006). The 20m shuttle run test, a measure of cardiorespiratory endurance, was the most commonly employed test, yet there has been some concern over the appropriateness and accuracy of such maximal tests in school settings (Wrench & Garrett, 2008). However, an extensive review conducted by the Institute of Medicine concluded that the 20m shuttle run test is the most practical, valid and reliable test for assessing cardiorespiratory endurance in school settings (Pillsbury et al., 2013). That said, teachers should be given the scope to administer tests that are most appropriate for the context in which they are teaching and submaximal alternatives such as a step test could therefore be considered (Buckley, Sim, Eston, Hession, & Fox, 2004). Many researchers have also questioned the practice of monitoring body composition in school settings, suggesting that it is could lead to body shaming (Alfrey & Gard, 2017). Although it was the
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least frequently assessed component, it was assessed by over one quarter (26.3%) of teachers with at least one year group. Many test batteries used internationally, including Fitnessgram and ALPHA, among many others, include some form of body composition or anthropometric measure. The authors agree with Cale et al. (2014) who suggest that any measurements of body composition should be dealt with sensitively and not forced upon students.

Differences in boys’ and girls’ reactions

Another finding of interest was teachers’ perceptions of students’ reactions to HRPF testing. Twice as many teachers (65%) felt that boys had a more positive reaction to compared fitness testing to girls’ (37%). This corroborates the findings from a recent exploratory study and Hagele (2018) which investigated the factors that influence high school girls’ enrolment in elective physical education. Participants (n = 17 girls) acknowledged the importance of HRPF, but desired less of a focus on fitness testing. Similarly, Zhu, Chen and Parrott (2014) found that boys reported significantly higher situational interest in the PACER test in comparison to girls and that personal interest was a significant predictor of performance (Zhu et al., 2014). The prominence of the 20m shuttle run test in schools’ HRPF monitoring practices could be a significant factor in explaining the disparity between boys and girls experiences of HRPF tests. Students’ motivation to participate in HRPF testing could have a significant impact on their performance (Mercier & Silverman, 2014b). Consequently, further research is needed on how best to integrate such tests to ensure that girls in particular are comfortable performing fitness tests and motivated to try their best. Graser and colleagues (2011) suggested that students responded most positively to a self-testing format. Moving away from command-style test administration, where the teacher controls everything, to a more reciprocal self or peer-assessed approach was also strongly recommended by Silverman and colleagues (2008). In addition, the authors highlight the insufficient attention that has been given to HRPF testing in pre-service teacher education programmes as an issue.
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An encouraging outcome of this study was the reasons provided by teachers for including HRPF testing as part of their physical education programmes. The vast majority (91%) who were in support of HRPF testing most frequently cited the opportunity for student learning, enhancing students’ awareness of the importance of HRPF and promoting self-evaluation through the creation of personal fitness profiles as the most common reasons for using fitness tests. Claims of ‘fitness for performance’ discourse dominating the delivery of HRPF amongst physical education teachers in other studies (Alfrey, Cale, & Webb, 2012; Harris & Cale, 2007; Harris & Leggett, 2015) were not in evidence from the participants’ responses in this study. The most frequently cited reason for including HRPF monitoring as part of a physical education programme were the learning opportunities it presented for students. Of the less than 10% (n = 22) of teachers who cautioned against the use of HRPF testing, most identified the potentially serious consequences of misuse, particularly for the least active students. The importance of the process of engaging in and learning from the tests, rather than the product of the test results, was expressed by many teachers and indeed, a process-orientated approach to monitoring has been identified as a key step in the appropriate administration of HRPF tests in school settings (Cale et al., 2014). When results are used as part of the learning process, it is suggested teachers should avoid inter-student comparisons, focusing instead on self-comparisons with criterion referenced health standards (Ernst, Corbin, Beighle, & Pangrazi, 2006). Consistent reinforcement of health-related fitness components, in addition to the purpose of each test, is also considered critical in ensuring a process rather than product focused approach (Phillips, Marttinen, & Mercier, 2017) in which fitness testing is incorporated as part of a broader fitness education unit of learning.

Limitations and strengths

Caution should be applied when interpreting the results of this study. Firstly, although the sample was shown to be nationally representative, it was not random. The survey was also sent to
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each school's general e-mail address as opposed to directly to physical education teachers which may have led to some non-response bias. The limited five week time scale due to the end of school term may have hindered the recruitment of a larger sample size. This survey was based on a single data source. Consequently, data were not verified a second time, potentially leading to a lack of depth in the interpretation of responses, for which qualitative methods may have provided further insights. In addition, the survey did not include information on the impact of key variables including age and ability level on engagement with fitness testing. However, this study had numerous strengths including: a nationally representative sample of almost one third of all secondary schools in the Republic of Ireland; a regional spread of participants that was consistent with state demographics; and the inclusion of participants with a wide range of teaching experience, as detailed in Table 1. In addition, the authors followed a comprehensive survey design protocol in an effort to maximise the content validity of all questions included in the survey.
Health-related fitness monitoring practices in secondary school-based physical education programmes.

**Conclusions**

This study confirms that HRPF testing is highly prevalent in secondary school-based physical education programmes in the Republic of Ireland. Statistically significant differences were identified in testing frequency between year groups, and in the reactions of boys in comparison to girls to HRPF testing. The majority of teachers indicated that they did not share test results with students’ parents. Special attention needs to be paid to the uses of and reporting of HRPF results. Consideration should be given to the development of digital platforms to facilitate physical education teachers in tracking and reporting students’ HRPF and other important healthy lifestyle habits including physical activity. Research is also needed into young students’, and especially girls’ experiences of fitness testing. In conclusion, actions are needed from key stakeholders involved in the delivery of pre-service and in-service physical education, to promote consistency in the use of best practice approaches to HRPF monitoring in secondary schools.

**Acknowledgements**

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Health-related fitness monitoring practices in secondary school-based physical education programmes.

**References**


Health-related fitness monitoring practices in secondary school-based physical education programmes.


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Table 1. Demographic profile of participants.

<table>
<thead>
<tr>
<th>Category</th>
<th>Sub Category</th>
<th>n (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Gender (Participants)</strong></td>
<td>Female</td>
<td>185 (56.6%)</td>
</tr>
<tr>
<td></td>
<td>Male</td>
<td>142 (43.4%)</td>
</tr>
<tr>
<td><strong>Years Teaching</strong></td>
<td>1 (or less)</td>
<td>19 (5.8%)</td>
</tr>
<tr>
<td></td>
<td>2 to 5</td>
<td>62 (21.2%)</td>
</tr>
<tr>
<td></td>
<td>6 to 10</td>
<td>69 (18.8%)</td>
</tr>
<tr>
<td></td>
<td>10 to 19</td>
<td>101 (30.9%)</td>
</tr>
<tr>
<td></td>
<td>20 (or more)</td>
<td>76 (23.3%)</td>
</tr>
<tr>
<td><strong>School Sex</strong></td>
<td>Boys</td>
<td>47 (14.4%)</td>
</tr>
<tr>
<td></td>
<td>Girls</td>
<td>67 (20.5%)</td>
</tr>
<tr>
<td></td>
<td>Mixed-sex</td>
<td>213 (65.1%)</td>
</tr>
<tr>
<td><strong>School Type</strong></td>
<td>Public</td>
<td>203 (90.2%)</td>
</tr>
<tr>
<td></td>
<td>Private (Fee Paying)</td>
<td>32 (9.8%)</td>
</tr>
<tr>
<td><strong>No. of Students per class</strong></td>
<td>&lt;20</td>
<td>23 (7.0%)</td>
</tr>
<tr>
<td></td>
<td>20-25</td>
<td>121 (37.0%)</td>
</tr>
<tr>
<td></td>
<td>26-30</td>
<td>171 (52.9%)</td>
</tr>
<tr>
<td></td>
<td>&gt;31</td>
<td>12 (3.7%)</td>
</tr>
<tr>
<td><strong>Regional Breakdown of Schools</strong></td>
<td>Dublin (City + County)</td>
<td>49</td>
</tr>
<tr>
<td></td>
<td>Connaught</td>
<td>31</td>
</tr>
<tr>
<td></td>
<td>Leinster (ex. Dublin)</td>
<td>62</td>
</tr>
<tr>
<td></td>
<td>Munster</td>
<td>77</td>
</tr>
<tr>
<td></td>
<td>Ulster (Donegal, Cavan, Monaghan)</td>
<td>15</td>
</tr>
</tbody>
</table>

*The Republic of Ireland is divided into 4 provinces; Leinster, Munster, Connaught and 3 counties in Ulster. Dublin, Ireland’s largest city, comprises of almost 1/3 of the total population, is considered a separate region for the purpose of this demographic profile.*
Breakdown of components assessed per year group.

Year 1 (15 years)  Year 2 (14 years)  Year 3 (15 years)  Year 4 (15 years)  Year 5 (17 years)  Year 6 (18 years)

- Cardio Respiratory Endurance
- Muscular Endurance
- Muscular Strength
- Flexibility
- Body Composition

171x101mm (96 x 96 DPI)
Field based test measures used by PE teachers.

- Skinfolds
- Waist Circumference
- Weight
- Height
- Back/Shoulder flexibility
- Sit & reach
- Pull Up
- Handgrip Strength
- Vertical Jump
- Plank hold
- Standing Long Jump
- Sit Up Test
- Press Up Test
- Yoyo Test
- Step Test
- 1 Mile Run/Walk
- 12 minute run
- PACER (20m SRT)

Number of teachers.

170x197mm (96 x 96 DPI)