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PHYSICAL LITERACY AND FITNESS ASSESSMENT

for selected children from

London PRIMARY SCHOOL

FINAL REPORT AND FINDINGS



Introduction

In 2018, Rackets Cubed began a yearlong educational and physical activity intervention project for selected pupils from XXX London Primary School.

The intervention was targeted at pupils from Years 4 and 5 to help improve their health, fitness and basic maths skills.

In November 2018, Fitmedia were engaged to carry out an evaluation of the impact of the project on the children's physical literacy and fitness.

Fitmedia therefore designed a testing programme to assess the children's initial levels of physical literacy and fitness at the start of the project. This would provide a baseline against which to measure the impact of the project. The testing would then be repeated at the midpoint of the project and at the end.

Testing Timetable

This testing programme was implemented in November 2018. From that time, the children were assessed with these tests on the following dates:

- Baseline Test ("**Test 1**") – November 2018
- Interim Test ("**Test 2**") – March 2019
- Final Test ("**Test 3**") – July 2019.

Testing Programme

The testing programme comprised four tests, as follows:

- **2M Catch** – This is a simple assessment of children's object control and catching skills. It assesses both technique (is the child using the correct stance etc) and accuracy (is the child able to perform a set number of catches successfully).
- **Standing Broad Jump** - This test measures the maximum horizontal distance a child can jump. It measures both their coordination (as it requires coordination between leg and arm action) and lower body strength and leg

power. The results of this test are benchmarked against reference norms, which show how the children should have done based on their age and sex, which then provides a **percentile result**, to show how well the children performed.

- **Agility Run** - For this test the children are required to run up and down 10 times between two lines as fast as they can. This measures their **agility**, which is one of the most important physical movement skills. Agility is key for participation in most physical activity, as many sports and activities are **multi-directional** (requiring movement and coordination in different directions). Because of the way the test is laid out, it also measures speed and coordination. Agility also helps children **move better**, which helps **long term injury prevention**. As with the Standing Broad Jump, the results of this test are benchmarked against reference norms, which show how the children should have done based on their age and sex, which then provides a **percentile result**, to show how well the children performed.
- **Handgrip** – for upper body strength. The test directly measures the strength of muscles of the **hand** and **forearm**, by measuring how hard a child can grip a dynamometer. For most children, performance in this test is highly representative of strength in the larger muscles of both the **upper body** and the **legs**. Handgrip strength is also a good indicator of overall **muscle mass** and **bone strength** (including **bone density**). In addition, heavier children can do particularly well in this test (often better than their thinner peers). This is far less likely to happen in running or jumping tests, so the test may give some important self-esteem boosting positive feedback for heavier children. As above, the results of this test are benchmarked and a percentile result provided.

Results Analysis

For three of the tests, (Standing Broad Jump, Agility Run and Handgrip), the scores from the tests were analysed using the Fitmedia unique benchmarking system.

In this system, the score obtained is benchmarked against what their distance **should have been**, based on their age and their gender. This gives a **percentile**

ranking, showing how well the participant would have done against their peers at a national level.

This provides a completely objective way of assessing fitness for each child's gender and stage of development.

For example, a handgrip score of 29.1kg for a boy in Year 6 would give a percentile ranking of 99, indicating that they scored better than 99% of the people of the same age and gender who took the same test.

The results from these three tests are then aggregated to provide an Aggregate fitness level, also ranked as a percentile

For ease of reference, the percentile rankings are then divided into five categories, shown overleaf:

Percentile categories and meanings

90th percentile and above	Result gives a ranking of 90th percentile or above - an excellent or outstanding performance. These children show a high level of fitness and a strong aptitude for running and should be encouraged to pursue this further
70th-90th percentile	Result gives a ranking of between 70th and 90th percentile - a very good performance – these children show strong potential and with a small increase in effort could move up to the elite category
50-70th percentile	Result gives a ranking of between 50th and 70th percentile - a level expected for their age and gender. These children are showing the average level of fitness for their age
20th-50th percentile	Result gives a ranking of between 20th and 50th percentile - a level lower than expected for their age and gender. These children are showing a level of fitness than average, but can improve very easily with a small increase in physical activity.
0-20th percentile	Result gives a ranking of 20th percentile or lower - a level considerably lower than recommended for good health and fitness. This is widely regarded as the "cut off" point for good health. Children with these rankings are showing a very low level of fitness and should be strongly encouraged to increase their levels of physical activity to ensure their long term good health.

The **2m Catch** was scored out of 100.

Year 4 – Results Overview

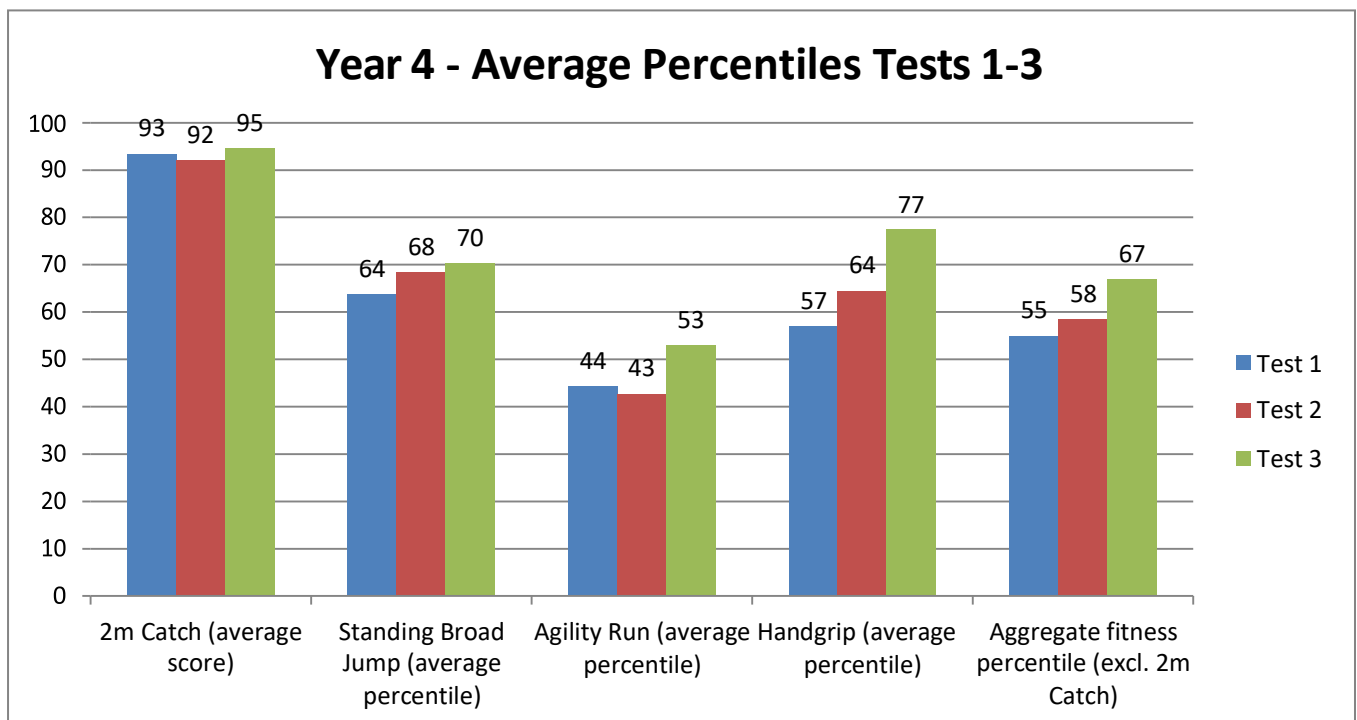
Assessment Overview

43 children from Year 4 were initially enrolled in the project. However, due to scheduling and absences, only 21 children were involved in Tests 1 and 3.

Overall there was a significant good improvement in the children’s fitness, both in relation to the different fitness areas and their aggregate fitness levels. More detail is provided below.

Year Group Results Summary

The average percentile across the group across all three tests is compared below:



As can be seen, there were significant improvements across all four fitness areas, and in their Aggregate fitness levels.

The largest improvements were in the Agility Run and the Handgrip. This would indicate that the programme has had a strong impact on the children’s lower body power and their upper body strength and muscle mass.

Year 4 – Results by Fitness Area

As stated above, the average percentiles from all the tests rose from Test 1 to Test 3.

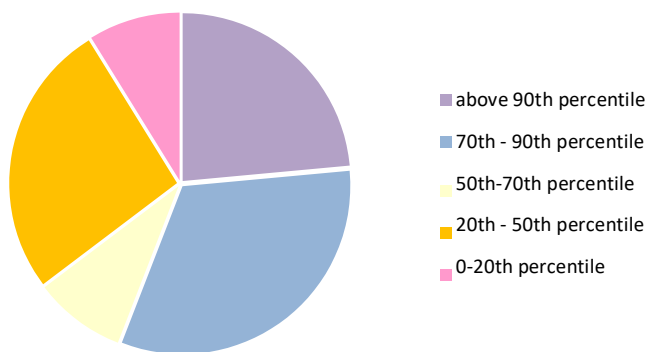
This reflects the fact that at an individual level, across every test, the vast majority of children improved their performances in all of the tests. More detail on this is provided in the table below:

Test	No. of improvers/ decliners
2m Catch	17/ 4
Standing Broad Jump	15/ 6
Agility Run	15/ 6
Handgrip	16/ 5
Aggregate fitness	16/5

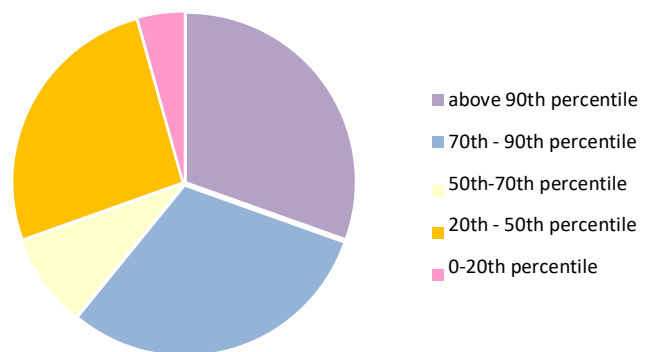
The improvement in the average percentile is reflected in the spread of percentile categories across each area – ie how many children scored in each percentile category in each area. More detail on this is provided below¹:

Standing Broad Jump

Test 1 - SBJ percentile categories



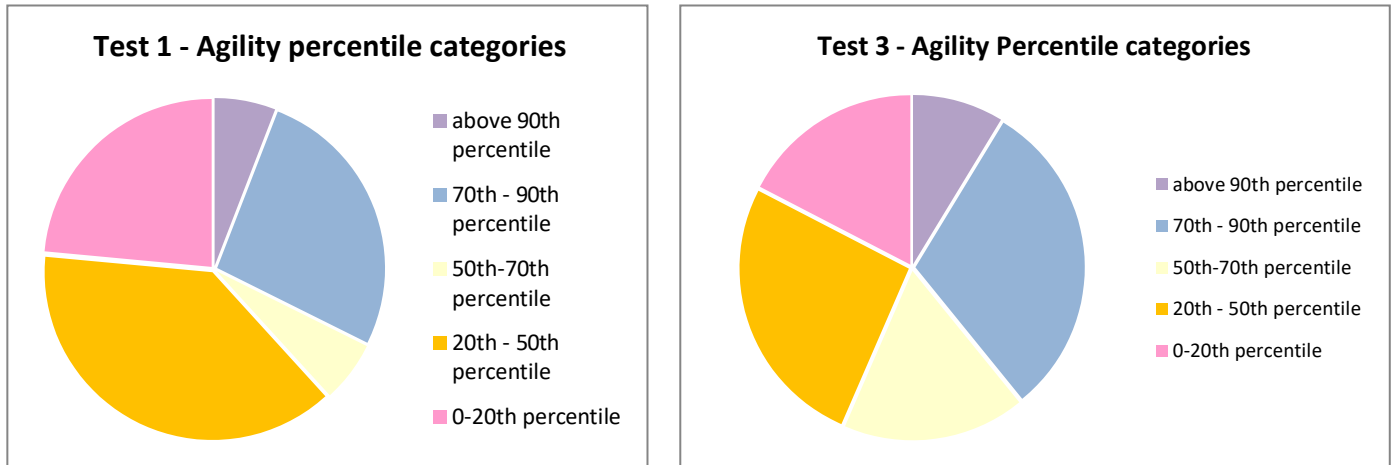
Test 3 - SBJ Percentile categories



¹ NB No graphs are shown for the 2m Catch and Throw as this is scored differently

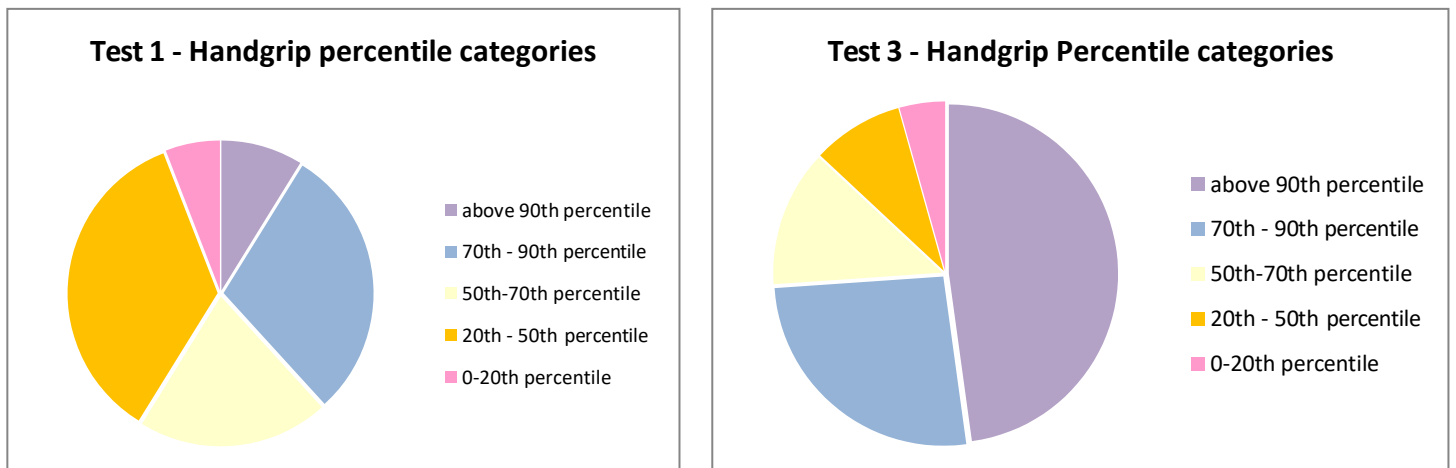
As can be seen, by Test 3, a smaller proportion of children were scoring in the lower percentile categories (0-20th percentile and 20-50th percentile) than in Test 1. A larger proportion were also scoring in the top percentile category (above 90th percentile), indicating more children performing more strongly in this area.

Agility Run



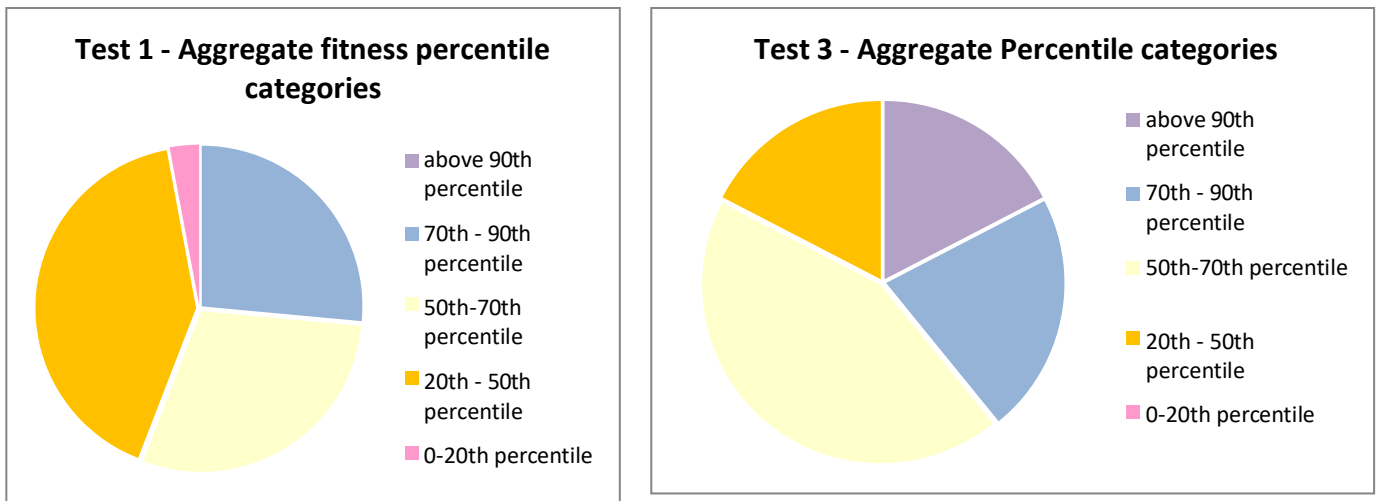
As with the Standing Broad Jump, Test 3 showed a smaller proportion scoring in the lower percentile categories than in Test 1, indicating an improvement in agility across all the Year Group.

Handgrip Test



The improvement in the performance of the Handgrip test can be seen clearly here. In Test 3, nearly half the children scored above 90th percentile category, in significant contrast to their performance in Test 1. This shows the improvement in upper body strength and muscle mass in the children.

Aggregate fitness levels



The improvement in Aggregate fitness levels is seen here. Most significantly, by Test 3, none of the children in the Year group were scoring in the 0-20th percentile category. The 20th percentile is seen as the “cut off” point for fitness, as scores below this level are considerably lower than recommended for good health. At the start of the process, two children were scoring in this category – by Test 3, none of the children were in this category.

In addition, by Test 3 there were several children who were scoring above 90th percentile for Aggregate fitness, whereas in Test 1 none of the children reached this category.

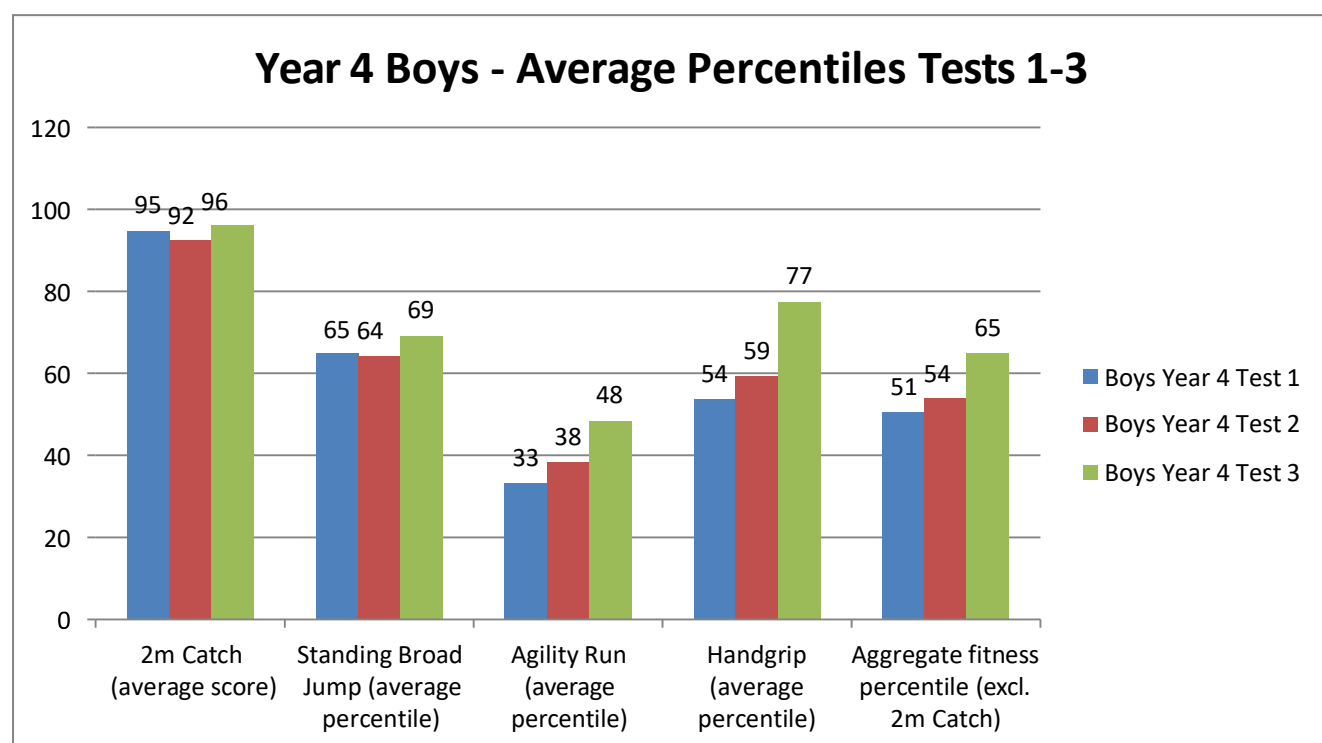
Year 4 - Gender comparison

The boys and girls performed slightly different across the programme.

Both genders improved their performance across all the fitness areas over the three tests.

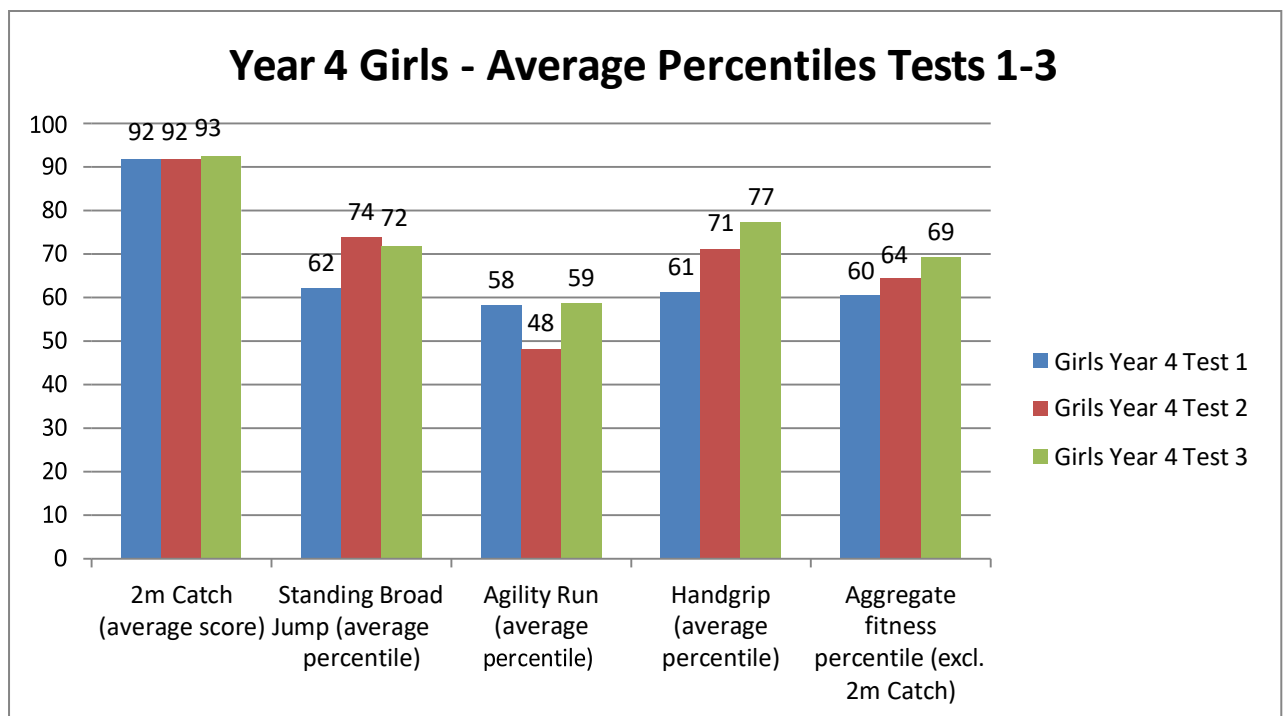
However, the boys showed the biggest improvement. More detail on this is provided below.

Overall performance: Boys



As shown above, the boys' Aggregate fitness level improved by 14 percentile points. Their biggest improvement was in the Agility Run (an improvement of 15 percentile points) and in the Handgrip (an improvement of 23 percentile points).

Overall performance: Girls



In contrast, the girls' Aggregate fitness level improved by 9 percentile points. Their biggest improvement was in the Standing Broad Jump (10 percentile points) and in the Handgrip (16 percentile points).

Boys v Girls: Direct Comparison

More significantly, comparison of results for both genders between Tests 1 and Tests 3 shows that the programme impacted on the gender groups in different ways.

In Test 1, the boys outperformed the girls on the 2m Catch and the Standing Broad Jump, showing they had better object control skill and lower body power.

However, in Test 1, the girls significantly outperformed the boys on the Agility Run and in the Handgrip, showing higher levels of speed, agility and upper body strength.

By Test 3, the girls were outperforming the boys on the Standing Broad Jump (the difference in performance on the 2m Catch remained the same).

The boys were still performing more weakly on the Agility Run, but the difference in performance was much reduced. In addition, they were now performing as well as the girls on the Handgrip.

In terms of Aggregate fitness, for both genders, their levels improved. At Test 1, the girls were fitter than the boys, by a margin of 9 percentile points.

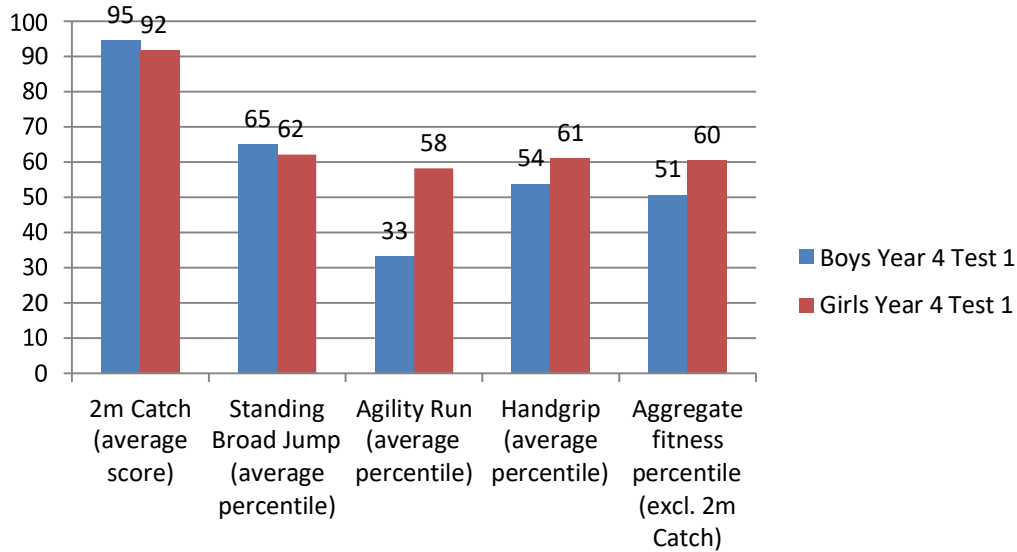
By Test 3, the girls were still fitter overall, but by a much reduced margin (4 percentile points).

More detail is provided on this in the graphs overleaf.

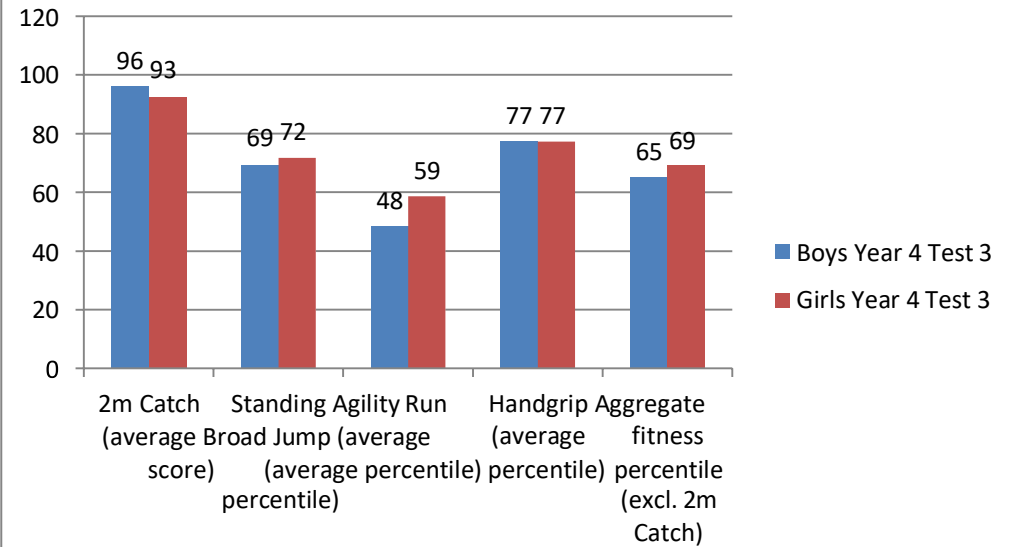
YEAR 4: BOYS V GIRLS PERFORMANCE:

COMPARISON: TEST 1 AND TEST 3

Test 1 - Year 4 Boys v Girls Average Percentiles



Test 3 - Year 4 Boys v Girls Average Percentiles



Year 5 – Results Overview

Assessment Overview

24 children from Year 5 were initially enrolled in the project. However, due to scheduling and absences, only 17 children were involved in Tests 1 and 3.

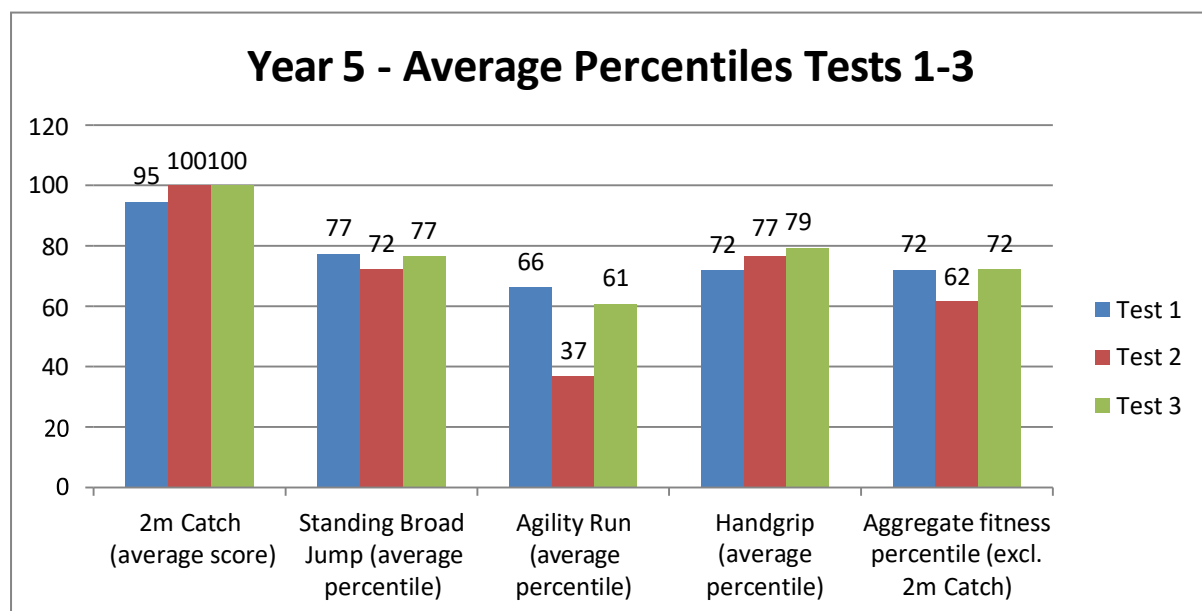
The results for Year 5 were good, though slightly weaker than for Year 4.

There was an average improvement in the 2m Catch test and in the Handgrip test, whilst the performance for the Standing Broad Jump remained the same. There was a slight decline in their performance in the Agility Run.

More detail is provided below.

Year Group Results Summary

The average percentile across the group across all three tests is compared below:



As can be seen, the children improved in the Handgrip test, indicating that the programme had a strong impact on their upper body strength and muscle mass.

There was also an improvement in their object control skills, shown in the 2m Catch assessment.

The results for the Standing Broad Jump remained the same.

There was a slight decline in their performance in the Agility Run.

This is actually common at this age, as agility tends to decline in children in Years 5 and 6, as children become less active and more involved in sedentary pursuits such as streaming or playing online.

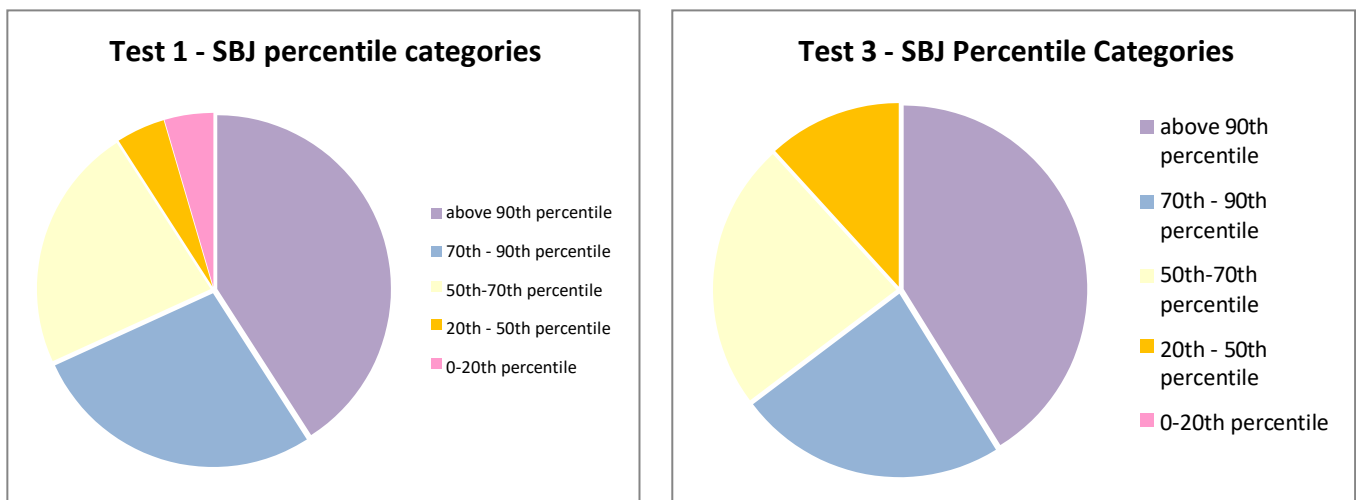
Overall, the Year 5s Aggregate fitness levels remained the same as at the beginning of the programme.

Year 5 - Results by Fitness Area

As stated above, the children improved their performances in two of the tests – the 2m Catch and the Handgrip. It remained the same in the Standing Broad Jump and declined slightly in the Agility Run.

This is reflected in the spread of percentile categories across each test – ie how many children scored in each percentile category on each test. More detail on this is provided below²:

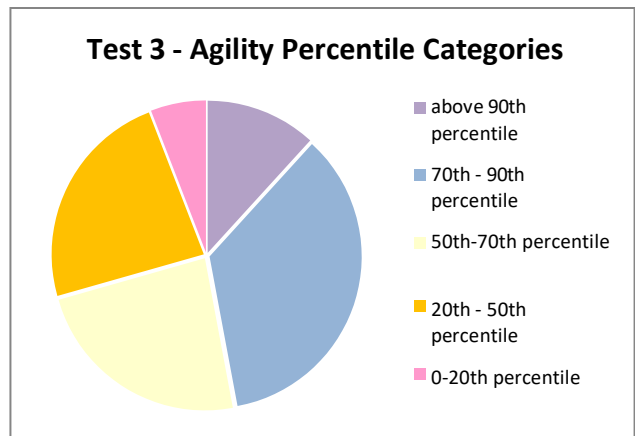
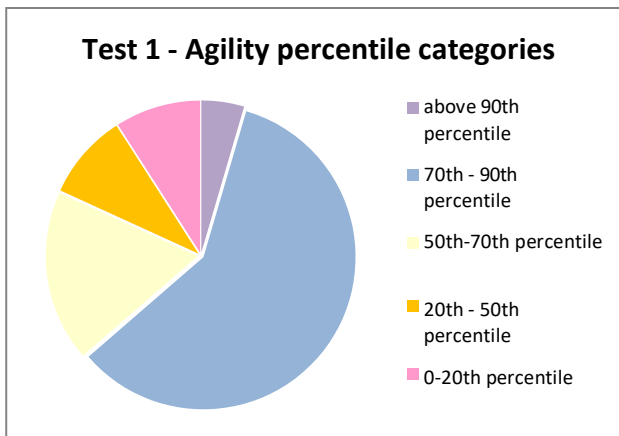
Standing Broad Jump



Whilst the overall average across the Standing Broad Jump remained the same, there was an improvement in the individual performances. Unlike in Test 1, by Test 3 none of the children were scoring in the 0-20th percentile category, and there was a slight increase in the proportion of children scoring in the 50-70th category.

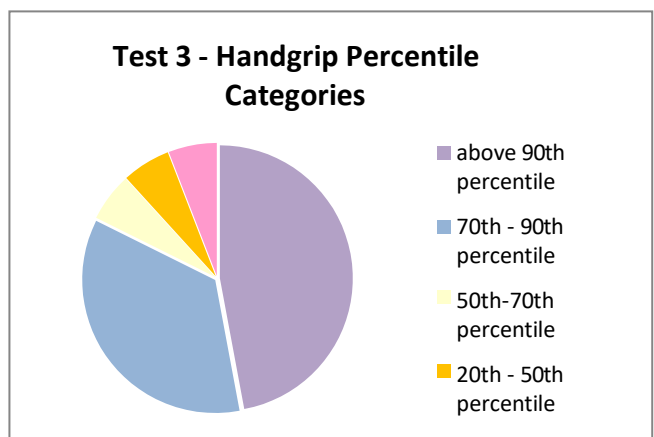
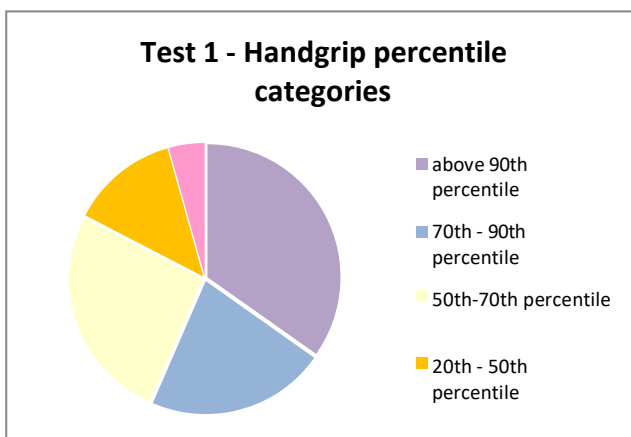
² NB No graphs are shown for the 2m Catch and Throw as this is scored differently

Agility Run



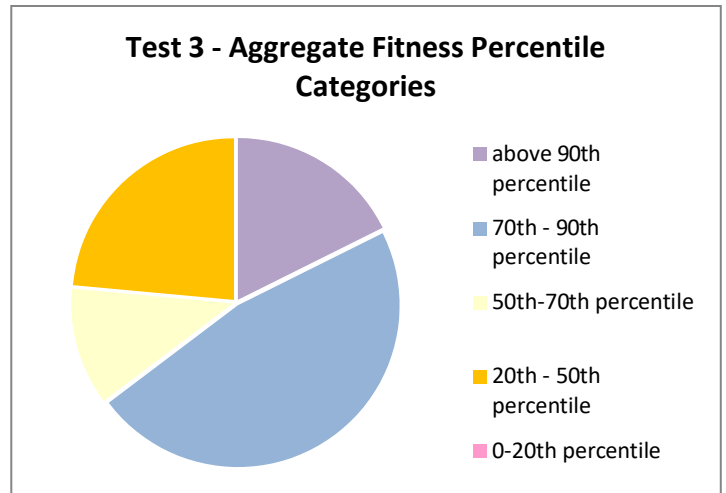
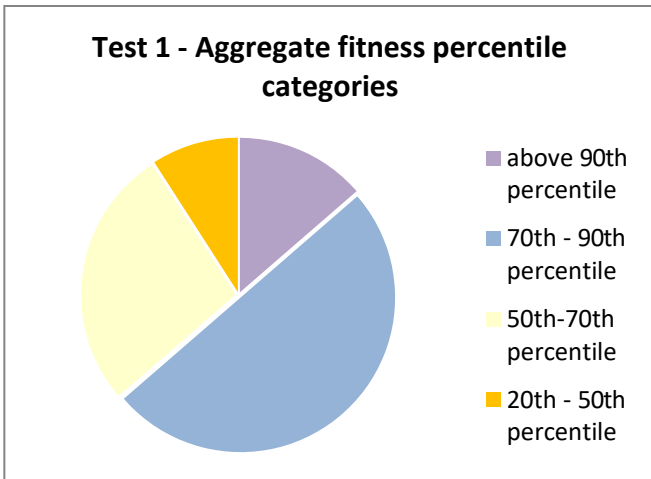
The decline in the performances on the Agility Run is easy to see here, with a higher proportion of children scoring in the 20th – 50th percentile category in Test 3.

Handgrip Test



The improvements in the Handgrip test can be seen here. In Test 3 there was a higher proportion of children scoring in the top two categories than in Test 1, and a far smaller proportion scoring in the 20th- 50th percentile category.

Aggregate fitness levels

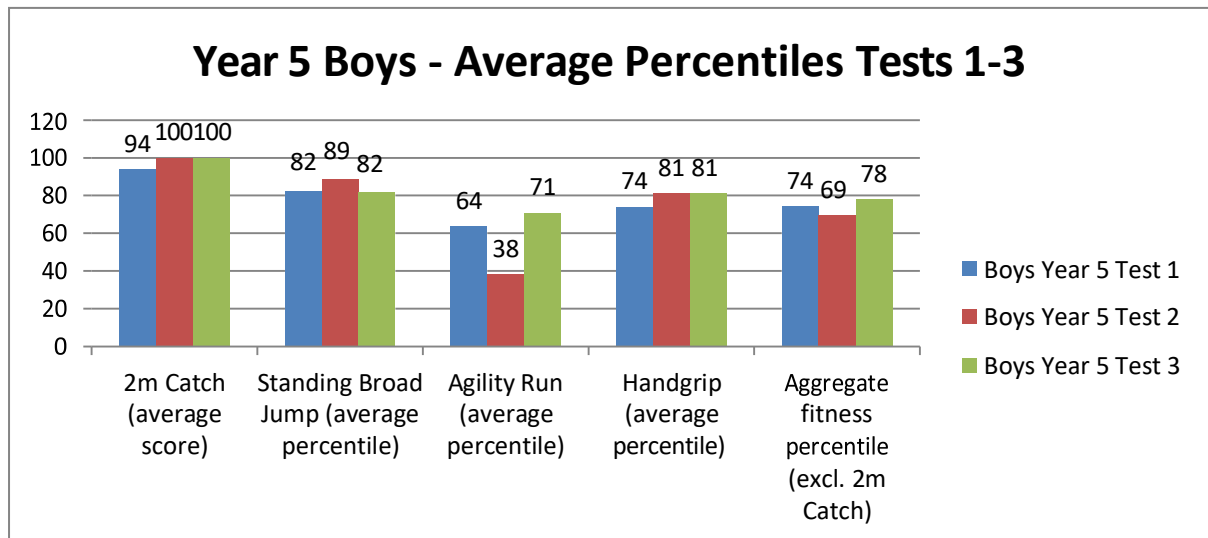


Whilst the overall average for Aggregate remained the same, there was an increase in the number of children scoring beneath 50th percentile. This is a reflection of the weaker performance in the Agility Run.

Year 5 - Gender comparison

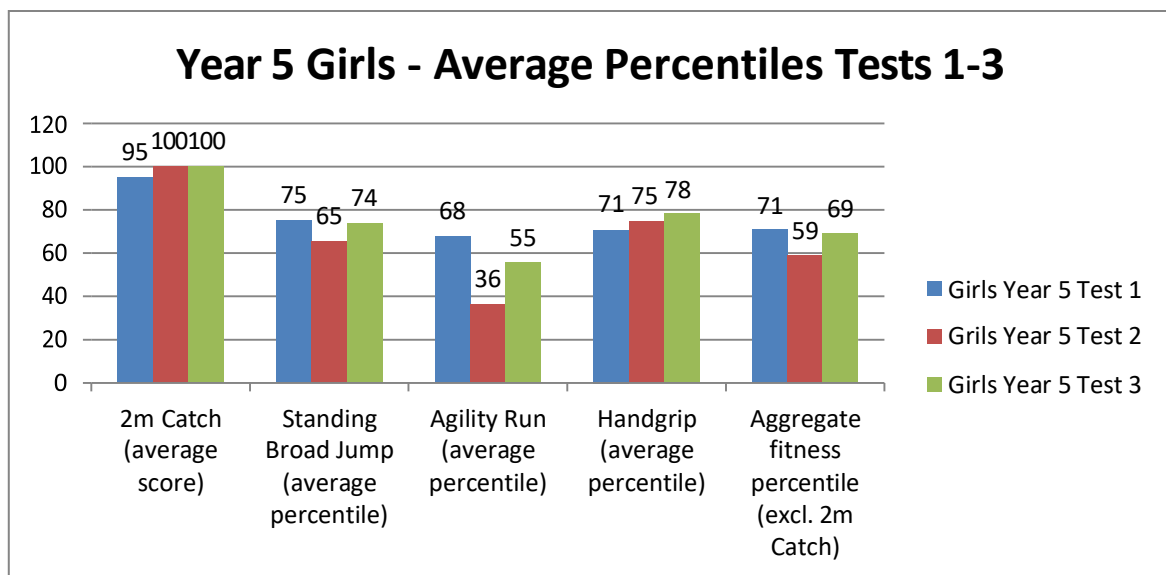
As with the Year 4s, the two gender groups performed slightly differently across the programme.

Overall performance: Boys



As can be seen above, the boys improved or maintained their performance across all the areas of fitness. Their biggest improvements were in the Agility Run and the Handgrip (7 percentile points), indicating that the programme had a good impact on their agility, speed and upper body strength.

Overall performance: Girls



In contrast, the girls' performance declined (marginally) in the Standing Broad Jump, but significantly in the Agility Run (by 12 percentile points).

Boys v Girls: Direct Comparison

As with the Year 4s, comparison of results for both genders between Tests 1 and Tests 3 shows that the programme impacted on the gender groups in different ways.

At the start of the programme, both gender groups were performing at broadly similar levels across all the fitness areas, but the boys were slightly better at the Standing Broad Jump and the Handgrip.

However, the girls were outperforming the boys at the 2m Catch and the Agility Run.

By Test 3, both boys and girls were at the highest level for the 2m Catch, but the boys were outperforming the girls on every other test.

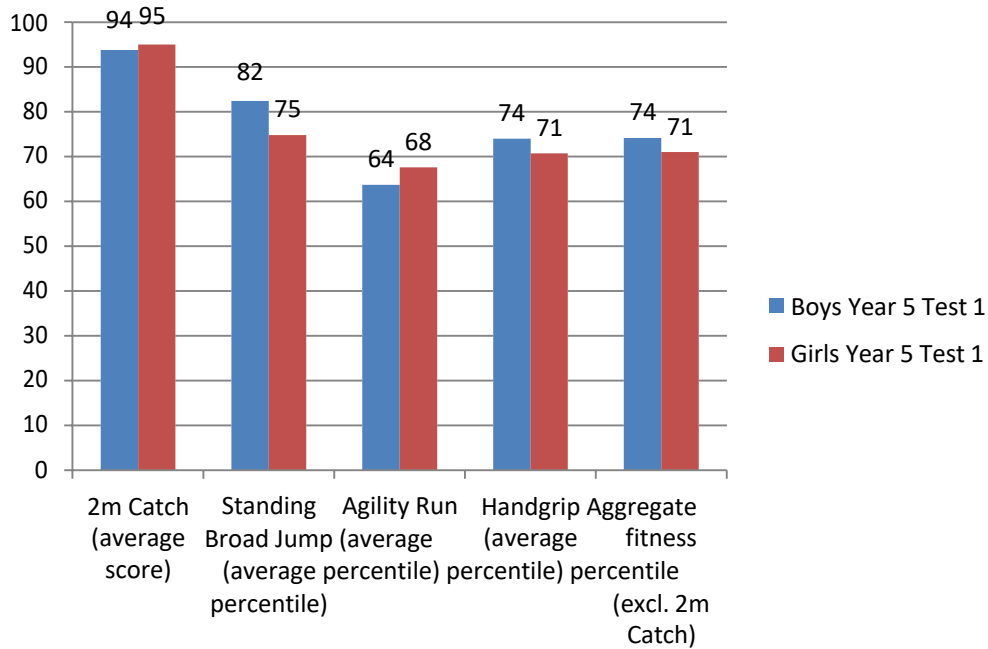
For the girls, their performance declined slightly in the Standing Broad Jump and significantly in the Agility Run (by 16 percentile points).

As a result, the boys' results in Test 3 were better than the girls'.

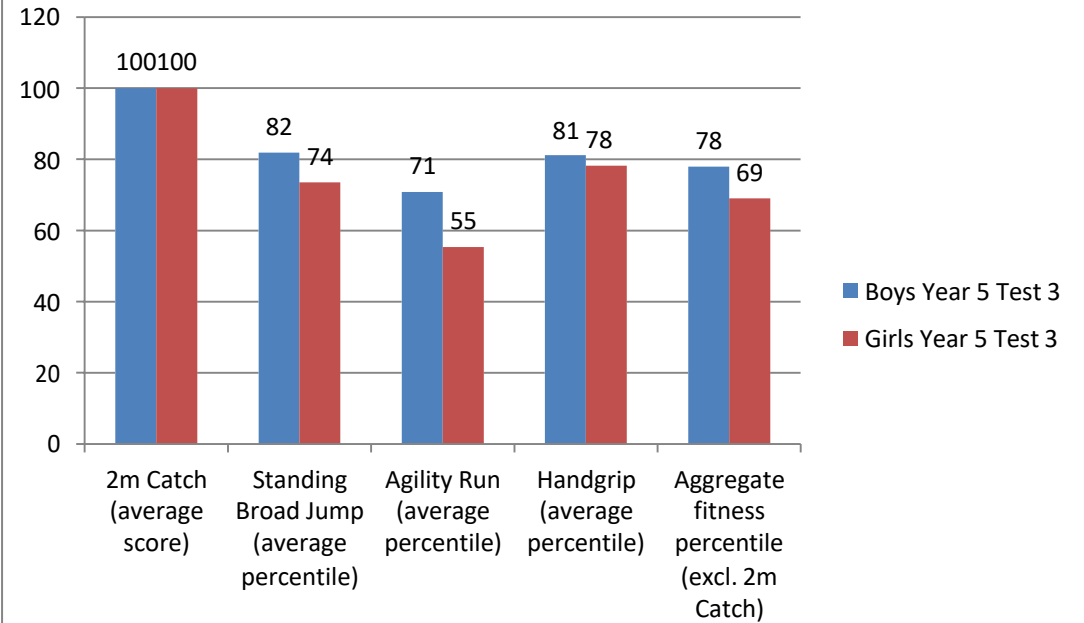
YEAR 5: BOYS V GIRLS PERFORMANCE:

COMPARISON: TEST 1 AND TEST 3

Test 1 - Year 5 Boys v Girls Average Percentiles



Test 3 - Year 5 Boys v Girls Average Percentiles



Summary and conclusions

Summary of key findings

1. The biggest impact was on Year 4. As a cohort, they improved their fitness across all four test areas, and their aggregate fitness levels also improved significantly (by 12 percentile points). At individual level, 16 of the 21 participants improved their aggregate fitness levels.
2. The biggest improvement area for the Year 4s was the Handgrip, where the average percentile ranking increased by 20 percentile points. This would indicate the programme has a significant impact on muscle strength and fitness in the forearm, as well as general upper body strength.
3. The results for Year 5 were also good, but not quite as comprehensive.
4. As a cohort, they improved their object control skills, as evidenced by a better performance in Test 3 in the 2m Catch test. They also improved their Handgrip performance.
5. However, there was a decline in their Agility. This can be largely attributed to the performance of the girls in this group, whose average agility ranking dropped 13 percentile points between Test 1 and Test 3.
6. As a cohort, the Year 5 group maintained their levels of aggregate fitness, which remained at the same level at Test 3 as at Test 1.

Conclusions

In conclusion, we would make the following observations:

7. The programme was successful in improving the physical fitness of the participants.
8. This is reflected in the fact that across 10 measures of fitness for two cohorts, only one (agility in Year 5) showed a decline. The remaining nine showed either an increase in the average percentile ranking or the same level, as follows:

Year Group	Test	Average Improvement/Decline
Year 4	2m Catch	2
	Standing Broad Jump	6 percentile points
	Agility Run	9 percentile points
	Handgrip	20 percentile points
	Aggregate Fitness	12 percentile points
Year 5	2m Catch	5
	Standing Broad Jump	Same ranking
	Agility Run	-5 percentile points
	Handgrip	7 percentile points
	Aggregate Fitness	Same ranking

9. The biggest impact was seen in the Year 4s, who improved across every area. This improvement was seen in both genders.
10. Whilst the impact was smaller in the Year 5s, this year group did improve their object control skills and handgrip.
11. The difference in performance across genders was more pronounced in the year 5 group: the boys in Year 5 improved or maintained their levels across every area: however, the girls declined in the Standing Broad Jump and the Agility.
12. It should be noted that a decline in Agility is extremely common at this age, particularly amongst girls. Agility is impacted significantly by regular physical activity, and this is widely recognised as the age when children, especially girls, become less physically active, as social and educational pressures increase.
13. In terms of the types of fitness, we would conclude that a programme of this kind has the largest impact on grip strength, upper body power and forearm strength. It should also be noted that this test is also highly representative of strength in the larger muscles of the legs, indicating that the programme also helps leg power.

14. The programme also impacted positively on agility, particularly in the younger children, and in object control throughout both age groups.

About Fitmedia

Fitmedia is a specialist fitness company which provides a range of health and fitness assessment systems for children, designed specifically for use by schools, local authorities and sporting organizations.

Fitmedia was established by sport and fitness professionals, who were frustrated at the lack of effective, efficient fitness testing for children.

Working with two of the UK's acknowledged experts in this area, Dr Gavin Sandercock and Dr Daniel Cohen, Fitmedia created testing systems to provide users with key data and information about their health, to improve their health and fitness levels, and to help children and young people, particularly those who may not be involved in representative school sports, with a means through which to engage with physical activity.

We have systems for children of all ages and abilities, from 6 to 18 years, to provide a complete overview of a child's physical movement skills, their levels of fitness and their own individual physical aptitudes. Our testing can also help identify and highlight potential causes for concern, such as low levels of fitness or specific injuries or areas of weakness.

Our testing systems are unique in that they are supported by scientific research data which allows us to see how well the children are doing ***based on their age and stage of development.*** In effect, they can be compared directly against what would be expected of a child their age and sex. As a result, the children are given a completely objective assessment of how they are progressing – and where and how to improve.



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